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ABSTRACT

Two studies were conducted to determine the educational effectiveness of innovative correspondence course materials. The studies were made simultaneously during the period from September 1976 through October 1977. Different materials were compared in terms of student performance, student acceptance of materials, course completion time, and relative performance of students with differing reading abilities. In each study innovative textual materials were compared to materials already in field use. The first study involved a three-way comparison of conventional materials, texts in the behavioral objective format (BOF), and an innovative modular BOF version of an apprentice-material facilities course. The second study compared a BOF version of a food-service specialists course with a version using the innovative high impact graphic technique. Findings for the conventional materials used in the first study were inconclusive, while in both studies each innovative concept proved to be more effective and was better accepted than each respective BOF version. (Author/CSS)

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UNITED STATES AIR FORCE

EXTENSION COURSE INSTITUTE

AN ANALYSIS OF TWO INNOVATIVE TEXTUAL FORMATS IN CORRESPONDENCE COURSE MATERIALS USED IN THE AIR FORCE ENLISTED CAREER DEVELOPMENT PROGRAM

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ABSTRACT

This paper describes and reports the findings for two studies conducted to determine the educational effectiveness of innovative correspondence course materials. The studies were made simultaneously during the period from September 1976 through October 1977. Different materials were compared in terms of student performance, student acceptance of materials, course completion time, and relative performance of students with differing reading abilities. In each study, innovative textual materials were compared to materials already in field use.

The first study involved a three way comparison of conventional materials, texts in the Behavorial Objective Format (BOF), and an innovative modular BOF version of an Apprentice Materiel Facilities course. The second study compares a BOF version of a Food Service Specialists course with a version using the innovative high impact graphic technique.

Findings for the conventional materials used in the first study were inconclusive while, in both studies, each innovative concept proved to be more effective and was better accepted than each respective BOF version.

KEY WORDS: Behavioral objectives, correspondence courses, reading ability, textbook evaluation, textbook illustrations, textbook research.

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This study was left on our doorstep ragged, undernourished, and orphaned by its natural parents. It was ragged in that the textbooks for the field study were not fully developed, and little thought had been given to evaluation. It was undernourished in a research sense, since neither a review of the literature nor the formulation of hypotheses had been attempted. And its natural parents, the PLATO and TICCIT educational computer systems projects for which our "innovative" texts were to provide achievement baselines, perished in a reanalysis of cost and need. Under these circumstances, it took a massive infusion of labor and support to formulate and conduct a field study of correspondence course textbooks.

It would be impossible to fully acknowledge the contributions of all of the people who had an impact on the project. Our apologies, in advance, are offered to all the numerous persons who have no doubt been unjustifiably omitted in the list that follows.

Lieutenant General Raymond B. Furlong, Commander of Air University, directed that the text development project be continued after the demise of the PLATO/TICCIT activity; in this he followed the recommendations of G. Ronald Christopher, Air Force Institute of Technology, who studied the problems and opportunities in the original project. Colonel Marvin E. Grunzke, Commandant of the Extension Course Institute, promptly

recognized the value of applied research on textbook effectiveness in the extension environment and committed appropriate money and people (and numerous hours of his own time) to its support.

Lieutenant Colonel Walter E. Hines headed the PLATO/TICCIT project, and he provided valuable assistance in laying the groundwork for the present study. Major Anthony J. Russo transferred from the original activity to the Extension Course Institute, where he led the Courseware Design and Development Task group during the completion of the text and test writing phases of the project.

Accompanying Major Russo to ECI's Evaluation and Research Division were several outstanding subject matter specialists: MSgt Charles R. Funk, TSgt Gary D. Clutter, TSgt Kenneth J. Ferrell, SSgt Thomas H. Gauger, SSgt Edward T. Hines, SSgt Stephen R. Page, and SSgt Clarence D. Sims. Two illustrators, SMSgt Danny B. Maverick and TSgt Richard E. Thiot, provided invaluable graphics support. Second Lieutenant Sanders Laubenthal, who conceived the High Impact Graphics course, devoted several weeks to assuring the smooth transition of her project from one organization to another.

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CHAPTER I

INTRODUCTION

The Extension Course Institute (ECI) of the Air University was established in 1950 to provide consolidated management and administration of the United States Air Force correspondence education program. A major responsibility of the organization is to provide career development courses (CDC) that support the Air Force "dual channel" approach to enlisted career progression. This concept supplements practical, supervised on-the-job training (OJT) with complimentary specialty knowledge through correspondence study.[1] The quality of these correspondence texts can have a major impact on job performance throughout the entire Air Force.

Historically, few changes have occurred in ECI's correspondence materials other than periodic currency revisions. Departures from the plain textbook appearance by innovations in physical format have been relatively minor.

An exception to the preceding statement centers around a 1973 decision to convert all ECI texts to the Behavioral Objective Format (BOF). A description of this concept appears later in this chapter but, simply stated, the method strives to insure minimum levels of achieve-

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[1]Department of the Air Force, On-the-Job Training, AF Manual 50-23 (Washington: Government Printing Office, 1974), p. 1-1.

ment through competency-based instructional techniques.[1] At this writing, about half of ECI's approximately 380 courses have been or are in the process of being converted to the BOF. Although studies of educational innovations in the classroom setting are numerous, few empirical data are available to substantiate or refute the educational merit of new concepts in the extension course environment.

Jovanovich (1969) is but one of many who emphasized the need for flexibility and innovation in teaching materials in light of the tremendous technological advances being witnessed.[2] Similar thinking led the Air University to initiate a pilot project in March, 1974 to examine the effectiveness of computer assisted instructional (CAI) techniques as a substitute for correspondence study in the "dual channel" career advancement system. Two Career Development Courses were selected for inclusion in this project; each to be programmed into an interactive computer/student medium. During subsequent field testing, students receiving training via these media would comprise the experimental groups while students in the control groups were to receive instruction using hard copy texts. These texts (described later in this chapter) were to be significant revisions of course materials already in field use and were to be produced using innovative formats. The utility of CAI techniques would then be experimentally assessed in terms including, but not limited to: information currency, student interest, student

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[1]W. Robert Houston and Allen R. Warner, "The Competency-Based Movement: Origins and Future," Educational Technology 17 (June 1977):14.

[2]William Jovanovich, "The American Textbook: An Unscientific Phenomenon--Quality Without Control," The American Scholar 38 (Spring 1969):234.

performance, and cost.[1]

In January 1976, the Air University Commander directed a new look at the justification for proceeding with the CAI project in view of increasing fiscal pressures. The detailed reassessment by Christopher that followed resulted in a recommendation that stated:

> ...in face of the uncertainty in the near future of cost-effective CAI systems suitable as an alternative for correspondence courses, ...the CAI dimension of the project should be terminated.[2]

This recommendation was adopted in February 1976, and further development of CAI programs ended. Alternately, it was recognized that since the innovative texts attendant to the CAI project were well under construction, they could be compared to existing traditional materials if their development was completed. ECI assumed the responsibility for this comparison in March 1976 and developed an evaluation plan that contained the following specific purposes:

a. To field test Career Development Course 62250, Food Service Specialist, presented in the Behavorial Objective Format versus a format containing contemporary narrative and high impact graphics.

b. To field test Career Development Course 64531, Apprentice Materiel Facilities Specialist, comparing three presentation media: conventional text, Behavioral Objective Format, and Modular Behavioral

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[1]A detailed description of this project is contained in "Documentation of the Extension Courses and Information Systems Pilot Program Through 1 February 1976" (Headquarters, Air University, Maxwell AFB, Alabama).

[2]G. Ronald Christopher, "Review Analysis of the PLATO/TICCIT Test Project Conducted From 6 January 1976 - 15 January 1976" (Headquarters, Air University, Maxwell AFB, Alabama), p. 22.

Objective Format.

Descriptions of each of these textual treatments are covered later in this chapter with examples in the appendixes.

Statement of the Problem

The problem under consideration in this study was to gather data concerning the relative educational merits of differing textual format treatments. All data had to be gathered by mail, with no face-to-face institutional/student interaction, to enable statistically accurate comparisons of materials based on student achievement, student acceptance and motivation, accommodation of different reading abilities, and time required for course completion.

Significance of the Study

The evolution of correspondence study in the Air Force from an offering of a few *voluntary* courses borrowed from the Army to the highly specialized, integrated and *mandatory* career development course system of today underscores the importance placed on the medium by the service. It is the most cost effective method of providing training to a student population numbering well over one-quarter million. If research can result in qualitative improvements, large payoffs in efficiency can be achieved.

Much of the past research in correspondence education has centered around empirical studies designed to compare nonresident to resident training and to determine student reactions to correspondence study.[1]

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[1]Ossian MacKenzie, Edward L. Christensen, and Paul H. Rigby, Correspondence Instruction in the United States (New York: McGraw-Hill Book Co., 1968), p. 155.

As alluded to earlier, little effort has been devoted to determine the effects of textual format changes on educational quality. In fact, MacKenzie, in the Correspondence Education Research Project (CERP) emphasized the distinct shortcoming in this area saying "...There was no marked agreement, however, that a generally good job had been done by most (correspondence) institutions on physical format."[1] Nor is this situation unique to correspondence materials. McKeachie, referring to educational textbooks in general stated: "Despite the age of printing as a technique, there is relatively little research on its use ...."[2]

The reasons for this deficiency, particularly in correspondence materials, are varied but seem to center on some basic realities. First, correspondence education is over 100 years old. This has caused the medium to become somewhat set in its ways thus generating a certain resistance to change. Secondly, the complexity and consequent high cost of innovating simply for experimental purposes makes the correspondence medium a less attractive channel for research than other media.[3]

The innovative texts produced for the CAI pilot project and ECI's firm committment to the need for continued and aggressive research to improve its educational effectiveness provided the opportunity for a

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[1]Ibid., p. 179.

[2]Wilbert J. McKeachie, "Research on Teaching at the College and University Level," Handbook of Research on Teaching, American Educational Research Association (Chicago: Rand McNally and Co., 1963), p. 1156.

[3]Leonard S. Stein, "Is Home Study a Stepchild?" Home Study Review, Winter 1961, p. 35.

contribution in this deficient area.

Hypotheses To Be Tested

a. That students who receive instruction by way of modified CDCs (newly developed) will perform significantly better on course examinations than those who receive instruction by conventional texts.

b. That high ability readers will perform significantly better than low ability readers on each respective field test course examination.

c. That, on the Food Services course examinations, high ability readers will show little difference in performance depending on training media while low ability readers will perform significantly better using the contemporary narrative/enhanced graphics version.

d. That, on the Materiel Facilities course examinations, high ability readers will show little difference in performance depending on training media whereas low ability readers will demonstrate poorest performance using conventional texts, intermediate performance with BOF, and highest performance using modular BOF texts.

e. That students receiving modified text instruction will display a significantly more positive attitude toward their training than those who receive instruction by conventional CDCs.

f. That the innovative texts will be completed in a shorter average time than current conventional and BOF volumes.

Assumptions and Limitations

This study was primarily concerned with the academic (CDC) performance of airmen participating in the dual channel training system.

Therefore, students who enrolled in the experimental courses voluntarily with no OJT commitment were not included in the test population. Members of the Air Force Reserve and Air National Guard were included on an equal basis with their active duty counterparts in keeping with the total force concept as long as they were mandatorily (OJT) enrolled.

It was recognized that OJT environments vary qualitatively between Air Force installations. Further, it was assumed that any data contamination attributed to this factor would be minimized by the random assignment of subjects to treatment groups. These differences represent reality in the Air Force training program and thus categorized this study as a field test as opposed to an experiment where strict laboratory controls could be achieved.

Conducting a field test by mail would result in a degree of data perishability. In addition to normal attrition in the test courses (10 - 14 percent in 1976), lost data would probably result from the necessity for voluntary participation in any survey procedure used.[1] However, by enrolling at least 100 subjects in each treatment group, it was assumed that sufficient data would survive to enable comparisons that were statistically sound.

Finally, since nothing in past ECI examination analyses indicated the contrary, it was assumed that minimal compromise existed in the currently used test instruments for each of the two study career fields.

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[1]Department of the Air Force, Air Force Privacy Act Program, AF Regulation 12-35 (Washington: Government Printing Office, 1975), p. 1.

Definition of Terms

Specialty Training Standard (STS). "An STS outlines the training required to achieve a skill(s) level within an airman Air Force Specialty (AFS). Through its use, the individual training of airmen is standardized and the quality of training controlled."[1]

Conventional Text. The conventional text is in straight narrative and, like a standard textbook, contains no explicit statement of objectives. The content of these texts is based solely on the Specialty Training Standard and the appropriate job description. (Appendix A.)

Behavioral Objective Format (BOF). Texts using the Behavioral Objective Format precede each block of material with specific objectives in behavioral terms that emphasize to the student desired learning outcomes. Following the material, exercises are provided that indicate to the student whether desired performance levels have been achieved. If not, the need for review is indicated. The BOF is the method currently used by preparing agencies for revision or creation of new courses. (Appendix B.)

Modular BOF. The modular concept is similar to the standard BOF except that each chapter stands as its own building-block entity (hence the term module). The student may thus work these volumes in any chapter order depending on his priorities. Other refinements include limited numbers of highly subject-focused illustrations and large spaces for marginal notes. (Appendix C.)

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[1]Department of the Air Force, Air Force Specialty Training Standards, AF Regulation 8-13 (Washington: Government Printing Office, 1974), p. 1.

Contemporary Narrative/Enhanced Graphics. The contemporary narrative with enhanced graphics concept uses profuse and varied illustrations, charts, and diagrams with a fictional character narrative to carry the intended lesson. (Appendix D.)

CDC 62250 (Food Service Specialist). This Career Development Course is designed to assist in the upgrading of Food Service personnel from beginning or entry levels to the semi-skilled level. The current course is in the Behavioral Objective Format with the experimental version produced in contemporary narrative/enhanced graphics.

CDC 64531 (Apprentice Materiel Facilities Specialist). A Career Development Course for entry level supply personnel. The current version of this course is in the conventional text format with experimental texts produced in the Behavioral Objective Format and the modular BOF. A three way textual comparison was thus possible in this career field.

Skill Levels. Skill levels are proficiency classifications used to upgrade enlisted personnel in each Air Force career specialty. They are numerically designated as follows: 1-level, helper; 3-level, semi-skilled (apprentice); 5-level, skilled (Journeyman); 7-level, advanced (supervisor); and 9-level, superintendent. Materiel Facilities and Food Service specialists participating in this evaluation were in formal upgrade training to the three and five levels respectively.

CHAPTER II

REVIEW OF RELATED LITERATURE

Evidence of carefully done research into innovative textual formats is extremely rare in educational literature. Even more absent are studies of this nature applied in the area of correspondence education. A look only a relatively few years into the past provides insight into this observation.

Wedemeyer and Childs, in a 1961 assessment of the achievements and potentials of correspondence study, explained the low esteem in which the medium was held by educators and the general public.[1] Although many reputable institutions existed (with their effectiveness well demonstrated), a few others served to create a falsely generalized image that was certainly less than desirable. Claims such as "It's Easy to Learn," "You, too, Can Enjoy a Big Salary," "Draw Me and Discover Your Talent," etc., had repeatedly reinforced that single adverse image.[2] With correspondence study thus stigmatized by commercial appeals, it was understandable that the national university structure was reluctant to expend research effort in an area whose mode of operation it considered unprofessional and even unethical. Federal Trade Commission intervention

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[1]Charles A. Wedemeyer and Gayle B. Childs, New Perspectives in University Correspondence Education (Chicago: Center for the Study of Liberal Arts Education for Adults, 1961), p. 70.

[2]Ibid., p. 71.

served to remove the cause of the correspondence study stigma in the early sixties, but the medium's recovery into academic credibility has been slow.

Wedemeyer and Childs defined some of the pressures that had helped in sustaining this recovery. Modern demands for education in increased variety, rapid social and technological change, and an increasingly mobile population had created educational requirements to the extent that conventional means could not begin to cope with the situation.[1] Thus, correspondence study had, even by 1961, grown into an important and integral part of the nation's educational complex.[2]

The entire decade of the sixties saw continued growth of an interest in correspondence instruction. This national attention led to a study by Mackenzie, Christensen, and Rigby which constituted the most thorough and searching examination of the medium to date. This Correspondence Education Research Project (CERP), published in book form in 1968, was stimulated by the National Home Study Council and the National University Extension Association under a grant from the Carnegie Corporation of New York. The study covered the historical development of the medium and examined programs offered by a variety of institutions; universities and colleges, governments, religious organizations, the Armed Forces, industry, and private home study schools. It examined problems facing correspondence study such as financing, acceptance by students and educators, and accreditation, and analyzed the effective-

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[1]Ibid., p. 5.

[2]Ibid., p. 3.

ness of the method as an educational vehicle, both pro and con. Finally, the study described future requirements necessary to sustain the integration of the correspondence medium into the national educational structure. Of particular importance to the present study was the emphasis on the general lack of attention given to the physical formats of textual materials.[1] Thus, the need for research in this area was again suggested.

In 1971, Childs surveyed the current status of research in correspondence education. Although she noted a recent increase in research, she stated "...this does not indicate any great upsurge in research activity. Evidences of carefully done research are still hard to find."[2] The studies she described were categorized according to reactions of students, student characteristics, completion rates, methodology, and achievement. Seventeen studies were presented in addition to the CERP with only one addressing methodology. Even that one did not treat textual format.[3] Again, the deficiency in this area of research was implicit.

As described in the preceeding chapter, ECI began converting its textual materials to the Behavioral Objective Format in 1973. In that year, Duchastel and Merrill published a review of twenty-eight studies

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[1]MacKenzie, Christensen, and Rigby, Correspondence Education in The United States, p. 179.

[2]Gayle B. Childs, "Recent Research Developments in Correspondence Education" in The Changing World of Correspondence Study, eds. Ossian MacKenzie and Edward L. Christensen (University Park: The Pennsylvania State University Press, 1971), p. 229.

[3]Ibid., pp. 236-37.

each of which tried to evaluate various aspects of the behavioral concept. These studies were categorized depending upon the specific evaluation objective: effects on learning (achievement), type of learning involved (knowledge versus comprehension), learner characteristics and time to criterion. In ten studies evaluating achievement, no consistent benefit or degradation was observed among students exposed to behavioral objectives.[1] Of seven studies concerned with types of learning, only one found objectives beneficial (in the knowledge area). Findings in the six other studies were inconsistent.[2] Eight studies were concerned with learner characteristics. Of these, one found that behavioral objectives benefited mid-ability students who were grouped based on scores in previous courses and one claimed that behavioral objectives reduced levels of state anxiety.[3] The remaining six were inconclusive when students were stratified on aptitude and standard ability tests. Three studies analyzing time to criterion were inconsistent.[4]

In 1973, ECI completed an internal study designed to compare the relative effectiveness of correspondence materials written in the BOF as opposed to those written in a conventional textbook manner. The results of that study indicated little or no difference between treatment groups

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[1]Philippe C. Duchastel and Paul F. Merrill, "The Effects of Behavioral Objectives on Learning: A Review of Empirical Studies," Review of Educational Research 43 (Winter 1973):57.

[2]Ibid., p. 59.

[3]Ibid., p. 61.

[4]Ibid., p. 62.

with students using different textual formats. However, there was some statistically non-significant evidence that the BOF offered some benefit for lower ability students.[1]

This study was subject to several limitations. Chief among these was the fact that the subject population was working toward the 7-level (supervisor) in the test career field. The primary difference in required knowledge between the 5-level (semi-skilled) and the 7-level is therefore in the supervisory area with most technical knowledge already acquired by the 5-level. It could therefore be concluded that some (possibly many) subjects already possessed sufficient technical information to successfully pass the 7-level end-of-course examination without additional study.

Secondly, the only criterion variables used were achievement scores on a pretest and later post test. Little consideration was given to uncontrolled variables which could have influenced test results. Siegel, Lautman, and Burkett, for example, found a significant improvement in criterion test scores among subjects using home study materials with a lowered reading grade level.[2] A reasonable extension of this finding is that if textual readability were held constant, individual differences in student reading ability would have a predictive value in terms of test performance. In a 1974 position statement, the School

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[1] Charles L. McMillin, "Behavioral Objectives Format Field Service Test: Career Development Course 30474X" (Extension Course Institute, Gunter AFS, Alabama, 1973), p. 5.

[2] Arthur I. Siegel, Martin R. Lautman, and James R. Burkett, "Reading Grade Level Adjustment and Auditory Supplementation as Techniques for Increasing Textual Comprehensibility," Journal of Educational Psychology 66 (December 1974):901.

Division of the Association of American Publishers noted that it cannot be suggested that materials alone are the sole determinant of student performance. Many other variables should be considered such as the nature of the students themselves, their attitudes, their abilities, and the environmental influences in the learning situation.[1] Only by so doing can the accuracy of textual assessments be increased.

The lack of comprehensive textual research is not unique to the correspondence study environment. Brodinsky, in 1975, reported on the state of the educational textbook art. The industry is larger, therefore changes to meet the demands of educators come slowly. Response has tended to reflect current pressures--elimination of bias and discrimination, increased emphasis on vocationally oriented materials, and even metric conversion have become first line concerns which have forced innovation into secondary importance. "Learner Verification" or assessing the effectiveness of new materials has been defined as the industry's most pressing need.[2] Publishers have acknowledged this need and have begun work on the problem. However, they admit that they have not yet formalized procedures for reporting their findings to educators.[3]

In summary, the literature contains little in the area of research into innovative textual formats, though it suggests the plausable

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[1]Lawrence Lipsitz, ed., "News Notes," Educational Technology 14 (March 1974):63-64.

[2]Ben Brodinsky, "Instructional Materials: The Changing Industry," NASSP Bulletin 59 (October 1975):54.

[3]Ibid., p. 56.

reasons for this deficiency.[1] More importantly, in identifying needed research, the literature suggests considerations and directions that have influenced the design of the current study. This design is discussed in chapter III.

[1]Shipp, whose doctoral thesis was not available until this report was in final draft, reached a similar conclusion about the lack of clear-cut findings in the literature. See William Lee Shipp, Evaluation of the Behavioral Objective Format as an Effective System for Air Force Correspondence Courses, University of Illinois at Urbana-Champaign, (anticipated) 1978. Though he noted equivocal findings, Shipp's study showed the Behavioral Objective Format to be superior to conventional texts as measured by exam scores (12.8% increase) and completion times (26% decrease).

CHAPTER III

DESIGN OF THE STUDY

Description of Research Design

Although the statistical methods used to evaluate each CDC were similar, this study was essentially two separate field tests. This dual approach was necessitated by the differing nature of the two CDCs originally selected for the Computer Assisted Instruction evaluation. Each course currently used in the field deals with different subject matter and is in different formats, i.e., conventional textbook and the BOF. The modified (field test) versions of each were also prepared in different formats, i.e., modular BOF and contemporary narrative/enhanced graphics. Also, since each CDC was oriented toward different skill levels, no common basis existed upon which to build measured comparisons *between* them. Thus, the only viable approach was to evaluate each CDC as a separate study. Figure 1 graphically illustrates the test career fields and the textual materials available for each.

Students enrolled in the currently used course versions constituted the control groups while those enrolled in each innovative version were experimental. A variation from the traditional experimental and control group concept occurred with the Materiel Facilities Specialists since two innovative texts were available for study. Subjects using these two sets of materials were compared not only to those in the control group but also to each other.

FIGURE I

COURSES AVAILABLE FOR EVALUATION

Food Service (CDC 62250)	Materiel Facilities (CDC 64531)
Behavioral Objective Format*	Conventional Text*
Contemporary Narrative, Enhanced Graphics	Behavioral Objective Format**
	Modular BOF

* CDC versions presently in field use.

** The Materiel Facilities CDC was converted by ECI to the BOF specifically for this field test. Thus, a comparison between three textual treatments was possible. It was not considered feasible to generate a conventional text for the Food Service specialty.

In each career field, data were gathered that enabled between group comparisons of dependent variables consisting of criterion test scores (achievement), course completion time (in days), and relative student acceptance of materials. In addition to differing textual formats, a measure of student reading comprehension was used as an independent variable both for treatment group assignment and for within group stratification. The specific data gathering instrument used and its applications are discussed later in this chapter.

Sampling Procedures

Data collection within the Food Service career field began prior to the actual field test of experimental materials. Since approximately eighty-five percent of Food Service personnel receive their initial training (3-level) at a resident school, an opportunity existed to

gather preliminary information on potential subjects for the current study. The resident Food Service faculty at Lowry Air Force Base, Colorado, administered to 210 resident 3-level students a test battery that contained a pretest of 5-level material, a measure of reading comprehension, an assessment of student attitudes toward their career field, and a limited survey of demographic data. (Appendix E.)

As students in each test career field enrolled in their respective CDCs, enrollments were screened to determine field test participation eligibility based on mandatory (OJT) status. Those Food Service personnel for whom preliminary data were available were assigned to control or experimental groups based on reading comprehension scores and sex. This prestratified each treatment group with a proportionate distribution of high and low ability subjects. The remaining Food Service and all Materiel Facilities students were assigned to treatment groups using a computer generated random sequence to minimize systematic bias and the effect of extraneous variables. Enrollment applications were then processed through the normal ECI automated system and appropriate materials issued.

Unique items enclosed with each set of materials included a post card form on which the student was requested to indicate the date of course material receipt and a set of instructions for the student's OJT monitor (see appendixes F and G). These instructions simply acknowledged the existence of a study in progress and enlisted the training monitor's support in insuring that each student used only the materials provided.

Enrollment goals were set at a minimum of 100 subjects in each treatment group in each career field. Prior experience with the enrollment characteristics (and anticipated attrition) of the test courses indicated that sufficient numbers would reach course completion to assure a statistically adequate population.[1]

After each student finished his program of study, an end-of-course examination (CE) was sent in accordance with normal ECI procedures. Accompanying this instrument was a test and survey battery designed to obtain necessary field test data. The battery included an attitude measurement device that assessed like or dislike for the course materials studied, an opinion survey and, for Materiel Facilities students and those Food Service specialists for whom pretest data were not available, a reading comprehension measurement and request for demographic data. Examination administrators were then instructed to return the CE answer sheets and all survey data to ECI in specially identified envelopes.

A detailed profile of student characteristics in each treatment group for each test course is shown in appendixes H and I.

Data Gathering Instruments

For the purposes of this study, course completion time was defined as the number of days between course package receipt and the date each subject received his end-of-course examination. A postcard was sent with each set of materials on which the student could enter the date of

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[1]Gene V. Glass and Julian C. Stanley, Statistical Methods in Education and Psychology (Englewood Cliffs: Prentice-Hall, Inc., 1970), pp. 376-77.

receipt. A space was provided on each answer sheet for the date of examination accomplishment. A comparison of these dates yielded a net time (independent of mail transit time) which was averaged for comparisons between groups.

A somewhat ambitious but more refined measure of completion time was attempted by asking each student to record the amount of clock time spent during each study session on a form provided. It was recognized at the outset that placing a responsibility of this nature on the student might be unreliable but, with large student groups, might prove an indicator of gross differences. The return of these forms was so low (less than 4 percent) and the entries so diverse that consideration was meaningless.

Student performance

Individual student performance measures were extracted from each end-of-course examination. Since, in both career fields, materials and tests differed slightly in objective coverage, subscores were derived that included only knowledge assessment common to all groups being compared.

Reading comprehension

To assess reading comprehension, a Cloze test was administered. Each student was given selected passages to read that related directly to his career field in which approximately every fifth word was omitted. The reader was required to supply the exact missing word by relying on his knowledge of the material and the context of the passage. The

Cloze instrument is administered in accordance with self-contained instructions and proved to be easily understood by students. According to research, this type of test is reliable and has demonstrated construct validity.[1] (See example at appendix J.)

Attitude measurement

Student attitudes were assessed using the semantic differential technique (example at appendix K). Subjects were requested to choose, on a seven point scale, between a series of bipolar adjectives such as "good - bad," "weak - strong," etc., in response to a specific question. The question asked of resident Food Service subjects was "I feel the Food Service specialty is" and, at course completion, all subjects in both career fields were asked "I feel that my ECI textbook materials were." Student responses were averaged to provide means for comparisons between groups. Research has shown the reliability of this technique, which is easily administered by untrained persons, to range from 0.88 to 0.95.[2]

Questionnaire

A twenty-five item questionnaire was also administered after examination completion (example at appendix N). It provided a means for gaining answers to specific questions pertinent to this investigation.

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[1]Raymond J. Horton, "The Construct Validity of Cloze Procedure: An Exploratory Factor Analysis of Cloze, Paragraph Reading, and Structure-of-Intellect" (Ph.D. dissertation, Hofstra University, 1973), p. 113. (University Microfilms No. 73-30,000.)

[2]Arthur Mathis, Timothy A. Smith, and Duncan H. Hansen, "College Student's Attitudes Toward CAI," Journal of Educational Psychology, vol. 61, no. 1 (1970), p. 50.

The instrument was constructed from a bank of standard ECI survey questions and carried USAF Survey Control Number 76-141. Percentages for each response were used for analysis.

Statistical Treatment

The primary vehicle for data storage and manipulation was the Air University Educational Time Sharing System. Data files were created that allowed within group calculations of standard statistical values: mean, median, mode, variance, and standard deviation. Group mean values were computed for performance scores, reading comprehension, semantic differential scores, and time for course completion. In both field test career fields, analysis of variance techniques were used for compairsons between groups. Additionally, a treatment by level design was used to test for interaction effect between performance scores among students with differing reading abilities. In all cases, statistical significance at the .05 confidence level was used as the criterion for hypothesis acceptance. Each Career Development Course is analyzed separately in the next two chapters, and specific data analysis procedures used are discussed.

CHAPTER IV

MATERIEL FACILITIES SPECIALIST STUDY

Introduction

In this chapter, the Materiel Facilities Specialist study will be described. First the student population and its assignment to experimental groups is defined. Then, the measures used for testing hypotheses are discussed and statistics for the measures are given. Next, the means of forming high and low reading ability groups are discussed, and finally, a description of, and report on each hypothesis tested is given. This is followed by a summary of the hypotheses tested.

The Student Population and its Assignment to Experimental Groups

The original subjects in this study were 302 students who enrolled in the Materiel Facilities Specialist course between 13 October 1976 and 5 January 1977. Subjects were randomly assigned to one of three groups, for which different course materials had been developed. Group one received conventional materials, group two received materials in the Behavioral Objective Format (BOF), and group three received modular BOF materials.

T subjects were randomly assigned to treatment groups as they enrolled in the three-level Materiel Facilities apprentice-level course (CDC 64531). Originally, 101 subjects were assigned to group one

(conventional), 100 to group two (BOF), and 101 to group three (modular). Of the original 302 subjects, sufficient data were available on 233 at the close of the study. Group one (conventional) and group two (BOF) retained 75 subjects each and group three (modular) retained 83 subjects. This amounted to a loss of 69 subjects, or 23 percent of the original population. As forecast in chapter I, about 10 percent of the population was lost through normal attrition. The remainder were lost due to incomplete data. Since participation in the study was on a voluntary basis, losses beyond normal attrition were anticipated. A summary of population assignment and losses is in Table 1.

TABLE 1

POPULATION ASSIGNMENTS AND LOSSES

Type of Course Material	Conventional	BOF	Modular	Total
Original number of subjects	101	100	101	302
Subjects lost by attrition	13	13	7	33
Subjects remaining after attrition	88	87	94	269
Subjects lost due to incomplete data	13	12	11	36
Final number of subjects	75	75	83	233

In appendix H, distributions showing demographics by group assignment, including race, sex, education, marital status, and number of dependents are given. The distributions reported are what would be expected through random assignment of subjects to each group.

Measures Used For Testing Hypotheses

Four measures were used to test the hypotheses; the statistics for each are shown in Table 2.

a. The conventional, BOF, and modular course materials differed in objectives covered as well as the ways of presenting subject matter. The course examination (CE) for the conventional course had 82 items, the BOF 75, and the modular 93. A total of 47 items were the same on all three examinations and were used as a comparable measure of group performance.

b. The sematic differential technique was used to obtain a measure of each subject's attitude toward his course materials. The attitude scale ranged from minus 3 to plus 3 with zero being the point of indifference.

c. A Cloze test was constructed from typical Materiel Facilities text materials and administered to each subject. These scores were used as a measure of reading comprehension.

d. A measure of completion time was obtained by subtracting the date on which each student received his course materials from the date that the student completed the course examination.

A similar population in each group is indicated by the similarity of the means and medians for each measure; the standard deviations also indicate similar distributions. The measures used showed no indication of having violated the basic assumption of normality that underlies statistical treatments used in this study (primarily the F-test, as used in analysis of variance techniques).

TABLE 2

STATISTICS ON MEASURES USED IN THE STUDY

Score	N	Mean	Median	Mode	Standard Deviation	Range	Reliability
Performance							
Conventional	75	74.31	76	72	9.54	40-91	
BOF	75	65.99	65	63	9.92	44-91	
Modular	75	69.95	68	65	11.16	46-93	
Total	233	70.07	72	65	10.76	40-93	.72
Semantic Differential							
Conventional	75	32.4	33	32	6.53	8-49	
BOF	75	30.4	30	35	6.57	13-46	
Modular	83	31.9	32	33	8.57	3-53	
Total	233	31.6	32	35	7.35	3-53	NA
Cloze							
Conventional	75	13.32	14	17	7.07	1-27	
BOF	75	14.02	15	15	8.60	0-30	
Modular	83	15.37	16	23	8.94	0-36	
Total	233	14.28	15	22	8.28	0-36	.85
Completion Time							
Conventional	49	66.27	64	48	23.33	13-146	
BOF	49	65.31	61	59	28.41	28-205	
Modular	55	72.16	69	69	23.35	27-154	
Total	149	68.15	65	64/69	25.26	13-205	NA

The reliability coefficients for the performance and Cloze scores were calculated by the Kuder - Richardson 20 formula for internal consistence of responses.[1] The performance score reliability (.72) had a standard error of 2.72 which would result in an individual score variation at the 99 percent confidence level of ± 7.01. The Cloze score reliability (.85) had a standard error of 2.79 resulting in an individual score

[1]George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Co., 1971), p. 368.

variation at the 99 percent confidence level of ± 7.21. Reliability coefficients for the semantic differential instrument and completion times were not calculated.

The Formation of High and Low Reading Ability Subgroups

Two of the hypotheses required the formation of subgroups consisting of students who demonstrated different levels of reading ability. Two subgroups were formed, a high reading ability subgroup and a low.

The following procedure was used in forming subgroups. First, it was noted (see Table 2) that the mean for the Cloze score for all treatment groups combined was 14.28. At the 99% confidence level an individual Cloze score would vary no more than plus or minus 7.01. Considering this, it was decided to use the mean as a center point and separate the high and low reading ability groups by at least 7 points. Thus the high reading ability group included all students who scored 18 or above on the Cloze test and the low reading ability group was composed of those that scored 10 or below. The frequency distribution of the Cloze scores for the high and low reading ability groups has been tabulated in Tables 3 and 4.

TABLE 3

FREQUENCY DISTRIBUTION OF CLOZE SCORES
HIGH READING ABILITY SUBGROUPS

Score	Conventional Frequency	BOF Freq.	Modular Frequency	Matched Cloze Scores Frequency
36			1	
35				
34				
33			1	
32				
31			2	
30		2	1	
29		2	1	
28		1	1	
27	1		2	
26		2	2	
25	1	2	3	1
24	3	1	2	1
23	2	2	5	2
22	6	5	3	3
21	3	3	3	3
20	1	4	3	1
19	2	3	2	2
18	4	2	4	2

TABLE 4

FREQUENCY DISTRIBUTION OF CLOZE/SCORES
LOW READING ABILITY SUBGROUPS

Score	Conventional	BOF	Modular	Matched Cloze Scores
10	2	2	4	2
9	2	6	3	2
8	3		1	
7	5		4	
6	2	2	2	2
5	4	5	2	2
4	2	2	2	2
3	4	1	3	1
2	3	6	3	3
1	1	4	3	1
0		1	1	

Hypotheses Tested

In all, eleven hypotheses were formulated and tested for the Materiel Facilities portion of the study. A description of each hypotheses and the resulting findings will be given in this section. The following format will be used for describing each hypothesis: First, the hypothesis will be stated in its experimental form. Next, the statistical techniques used for testing the hypothesis will be cited and the findings will be reported. For each experimental hypothesis tested, significance at or beyond the .05 confidence level was used for accepting the hypothesis as true. Analysis of variance techniques used followed Ferguson's descriptions of one and two way classifications.[1]

The first three hypotheses were grouped together as hypothesis "a" in the original proposal. As the first three hypotheses all pertain to treatment effects on students' performance and use the same statistical technique, they will be described together.

Effects of instruction on performance

Hypothesis 1 was that students who study modular course materials would show significantly better performance scores than those students who study BOF materials.

Hypothesis 2 was that students who study modular courses would show significantly better performance scores than those who study conventional materials.

Hypothesis 3 was that students who study BOF materials would show

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[1]Ibid., p. 208-45.

significantly better performance scores than students who study conventional materials.

The prior expectations were that examination performance by students would be greatest for group 3 (modular), less for group 2 (BOF), and least for group 1 (conventional). As noted in Table 2, the actual performance means differ from the expected rank order. The actual rank order was conventional (mean = 74.31) highest, modular (mean = 69.95) less, and BOF (mean = 65.99) least.

A one way classification analysis of variance was used to test each hypothesis. A comparison was made between performance scores for modular and BOF students to test the first hypothesis. The comparisons indicated a significant difference ($F(1,156) = 5.52$, $P < .05$) favoring the modular students' performances; thus, the first experimental hypothesis was accepted as being true.

A comparison was made between performance scores for modular and conventional students to test the second hypothesis. The comparisons indicated a significant difference, ($F(1,156) = 6.87$, $P < .05$) favoring the conventional student's performance. This was a significant but opposite finding of what was expected and consequently, the second experimental hypothesis was rejected.

A comparison was made between performance scores for BOF and conventional students to test the third hypothesis. The comparison indicated a highly significant difference, ($F(1,148) = 27.39$, $P < .001$) favoring the conventional students. This, too, was a significant but opposite finding of what was expected, therefore, the third experimental hypothesis was rejected.

The anomalies described in the preceding two paragraphs appear to be due to differences in volume review exercise and course examination overlap between the conventional and both BOF course versions. This was suggested by student responses on the opinion survey and is treated more fully in chapter VI.

Effects of reading ability on performance

The fourth hypothesis was that high ability readers will perform significantly better than low ability readers. To test this, a comparison was made between performance scores of 88 high ability readers (students who scored above 17 on the Cloze test) and 85 low ability readers (students who scored below 11 on the Cloze test). The comparison indicated a highly significant difference ($F(1,171) = 13.73$, $P < .01$) favoring the high ability readers. Thus, the fourth experimental hypothesis was accepted as being true.

Unique effects of treatments on reading ability levels

The fifth hypothesis was that high ability readers would show little difference in performance from one treatment to another while low ability readers would demonstrate poorest performance using conventional texts, intermediate performance with BOF, and highest performance using the modular materials.

High and low reading ability groups were formed using a procedure similar to that of the fourth hypothesis. The assignment of subjects differed, however, in that it required the matching of students in each of the groups based on their Cloze test scores. The number of matched groups for each score are shown in Table 3. The range of Cloze

scores for the high matched groups was from 25-18 and the range for the low matched groups was from 10-1.

As an example of the matching process, note that in Table 3, for a Cloze score of 22, the conventional treatment had six subjects, the BOF five, and the modular, three. Thus, for Cloze score 22, a maximum of three matched subjects was set by the modular group and subjects from the other two groups were randomly selected for assignment as matched subjects.

Table 5 shows the number of students for each cell, their mean CE scores, and the standard deviations of these scores.

TABLE 5

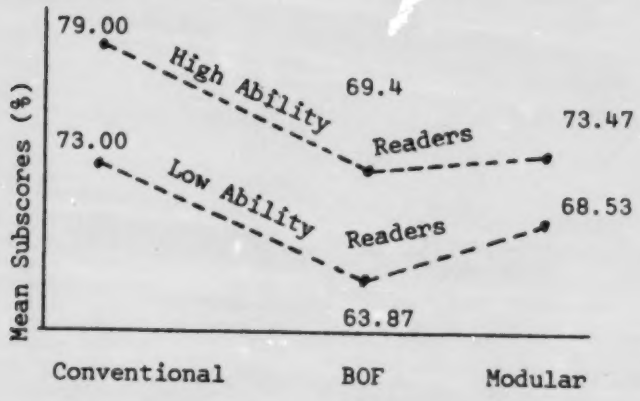
GROUP STATISTICS BY READING ABILITY LEVELS

Reading Ability Levels		Conventional	BOF	Modular
HIGH	Number of Subjects	15	15	15
	Mean CE Score	79.00	69.40	73.47
	CE Standard Deviation	7.46	7.34	8.91
LOW	Number of Subjects	15	15	15
	Mean CE Score	73.20	63.87	68.53
	CE Standard Deviation	9.20	8.38	8.03

The fifth hypothesis was tested by a two-way classification analysis of variance, computed on matched students assigned to each treatment at two levels, in a treatment by levels fixed model design. A comparison was made of the variability of the differences between the cell performance score means at each level across treatments. The average scores by reading ability and text format are shown in figure 2. The two-way interaction between treatments (conventional, BOF, and modular)

and levels (high and low reading ability) was not significant ($F(2,84) = .02$). Thus, the fifth experimental hypothesis was rejected.

FIGURE 2



The course examination performance curves for high and low readers are essentially parallel. This illustrates a lack of interaction effect which again causes rejection of the hypothesis.

Effects of format on student attitude

The next three hypotheses (6, 7, and 8) pertain to the students' attitude toward their courses. (These three hypotheses were derived from hypothesis "e" of the original proposal.) As the three are related and use the same statistical technique, they will be described together.

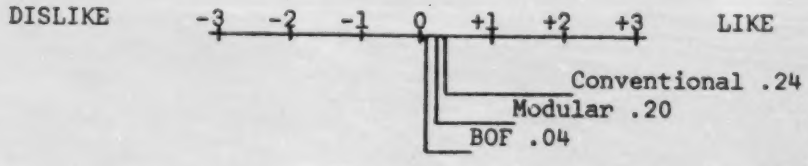
The sixth hypothesis was that students who studied the modular course would display a significantly more positive attitude toward their training materials than those who receive the BOF version.

The seventh hypothesis was that students who studied the modular course would display a significantly more positive attitude toward their training materials than those who received the conventional course.

The eighth hypothesis was that students who studied BOF course materials would display a significantly more positive attitude toward their course materials than those who received the conventional course.

The prior expectations were that the modular course materials would be most favorably received, the BOF materials less, and conventional materials least favorably received. As noted in Table 2, the actual semantic differential score means differ from their rexpected rank order. The actual rank order was conventional, 32.4, most favorably received; modular, 31.9, less favorably received; and BOF, 30.4, least favorably received. The scores are shown in Figure 3 in their originally scaled forms ranging from minus 3 to plus 3.

FIGURE 3



Each hypothesis was tested using a one-way analysis of variance. A comparison was made between semantic differential scores for modular and BOF students to test the sixth hypothesis. This comparison indicated modular students, more than BOF students, viewed their course materials favorably; however, the difference, ($F(1,156) = 1.71$) in the semantic differential scores for the two was not significant. Thus, the sixth experimental hypothesis was rejected.

The seventh hypothesis was tested by making a comparison between semantic differential scores for modular and conventional students.

This comparison indicated a reversal of what was expected in that conventional students, more so than modular students, viewed their course materials favorably, however, the difference, ($F(1,156) = .12$) was not significant. Hence, the seventh hypothesis was rejected.

A comparison was made between semantic differential scores for BOF and conventional students to test the eighth hypothesis. The comparison indicated a reversal of what was expected in that conventional students more so than BOF students held favorable views of their course materials and consequently, the eighth experimental hypothesis was rejected. The unexpected finding was not significant, ($F(1,148) = 3.63$, $P < .10$).

Effect of format on completion times

The ninth, tenth, and eleventh hypotheses pertained to completion time and were formulated as restatements of hypothesis "f" of the original proposal. As they are similar they will be described together.

The ninth hypothesis was that the completion time for students using modular materials would be significantly shorter than for students using BOF materials.

The tenth hypothesis was that the completion time for students using modular materials would be significantly shorter than for students using the conventional materials.

The eleventh hypothesis was that the completion time for students using BOF materials would be significantly shorter than for students using conventional materials.

The prior expectations were that students who received instruction by way of the modular course materials would require the least amount of

time to complete their course, students who received instruction by way of the BOF materials would require more, and those who used the conventional materials would require the most time. The actual rank order for completion time was BOF (65.31 days), conventional (66.27 days), and modular (72.16 days).

A one-way analysis of variance was used to test these hypothesis by comparing completion times for modular and BOF ($F(1,98) = 1.71$) modular and conventional ($F(1,102) = 1.62$) and BOF and conventional ($F(1,92) = .03$). As none of the F ratios were significant, all three experimental hypotheses were rejected.

Summary

Of the eleven experimental hypotheses, only two were accepted as being true. Specifically, modular students' performance was found to be significantly higher than BOF students and high ability readers' performance significantly higher than that of low ability readers. Two other findings were significant but were opposite to what was expected, in that conventional students' performance was found to be significantly higher than either the modular or the BOF students' performance. There were no significant findings on the seven remaining hypotheses.

CHAPTER V

THE FOOD SERVICE STUDY

Introduction

The Food Service study involves a comparison of texts in a behavioral objective format (BOF) versus innovative materials employing a high impact graphic (HIG) technique. This chapter consists of six sections. First, two categories of Food Service students are described, group assignments are specified, and student demographics by category and group of assignment are reported. This is followed by a description and statistical report of the measures used for hypothesis testing. Next, the method used in forming high, middle, and low reading ability subgroups is described. Then, each experimental hypothesis is described and tested, and an analysis of each is presented. This is followed by a brief summary of the hypotheses.

Categories of Subjects and Assignment to Treatments

Subjects were selected for the study and classified in two categories.

The first consisted of students who had recently attended the Food Service 3-level resident school at Lowry Air Force Base in Colorado. Students who attended between 4 August 1976 and 16 December 1976 were potential subjects for this study.

An instrument battery developed by the Extension Course Institute was administered to 210 of the Lowry resident students during the last five months of 1976. This instrument battery consisted of a course examination (CE) pretest for career development course 62250, a Cloze test for the 5-level Food Service Specialist course, a semantic differential scale for measuring student attitudes toward the Food Service Specialist career field, and a biographical information sheet.

The second category consisted of students who were either directed duty assignees (those who attained their 3-level by correspondence and had not attended the resident school) or students who had attended the resident school prior to August 1976. For subjects in this category, no pretest data were available; consequently, they were randomly assigned tc one of the two treatment groups.

Table 6 shows the source and assignment of subjects to the two treatment groups. A total of 131 usable subjects resulted from the 215 original assignments. As noted in chapter I, the expected attrition rate was 14 percent, or approximately 30 subjects. The actual attrition was 84 - about 34 percent. The higher than expected attrition rate was probably due in part to the fact that participation in the study was on a voluntary basis and in part to the recent civilian contracting of services normally performed by military food service personnel.

TABLE 6

TREATMENT GROUP ASSIGNMENT AND SUBJECTS RETAINED

Source	BOF	High Impact Graphic	Total
(Assignment to Treatment Groups)			
Category One (Resident Preparation)	53	54	107
Category Two (Non-Resident Preparation)	53	55	108
Totals	106	109	215
(Subjects Retained)			
Category One (Resident Preparation)	42	44	86
Category Two (Non-Resident Preparation)	18	27	45
Totals	60	71	131

The 107 subjects from the first category were assigned to the BOF and high impact graphic treatment groups in a manner that assured as close a match as possible on Cloze scores and sex. The stratification of category one subjects on Cloze scores and sex and assignment to treatment groups is shown in appendix L. The 108 students from category two were randomly assigned to either a BOF or high impact graphic treatment group.

In appendix I, demographics by category and group assignment, including race, sex, educational level, marital status and number of dependents are shown. There it may be noted that with the exception of sex -- seven females were assigned to the high impact graphic treatment group and none to the BOF -- the distributions for category two are what would be expected of random assignments.

Measures Used for Testing Hypotheses

Four measures were used to test the hypotheses. These were as follows:

a. The BOF and high impact graphic course materials differed in objectives covered as well as the ways of presenting subject matter. The course examinations for each textual version contained 124 items, 100 of which were common to the two examinations. These items were used as a comparable measure of group performance.

b. The semantic differential technique was used to obtain a measure of each subject's attitude toward his course materials. The original attitude scale ranged from minus 3 to plus 3.

c. A Cloze test was constructed from typical Food Service materials and administered to each subject. Cloze scores were used as a measure of reading comprehension.

d. A measure of completion time was obtained by subtracting the date on which each student received his course materials from the date on which the student completed the course examination. (A return postcard was included with all course materials with instructions to indicate the date materials were received.) Statistics on these four measures are shown in Table 7.

TABLE 7

STATISTICS ON MEASURES USED IN THE STUDY

Score	N	Mean	Median	Mode	Standard Deviation	Range	Reliability
Performance							
BOF	60	71.05	73	77	8.64	47-89	
HIG	71	74.13	75	77	6.99	57-89	
Total	131	72.72	74	77	7.91	47-89	.80
Semantic Differential							
BOF	53	32.74	32	31	6.40	14-47	
HIG	69	35.99	36	36	8.06	9-55	
Total	122	34.57	34	30	7.53	9-55	NA
Cloze							
BOF	60	20.07	22	24	7.39	2-36	
HIG	71	21.28	23	24	7.16	3-34	
Total	131	21.02	22	24	7.24	2-36	.79
Completion Time							
BOF	29	130.03	127	--	43.74	48-232	
HIG	40	100.03	104	--	39.16	17-225	
Total	69	112.64	109	--	43.47	17-232	NA

The similarity of each group is indicated by the statistics for each measure. The measures used showed no indication of violating the basic assumptions that underlie the statistical treatments used in this study (primarily the F-test as used in analysis of variance techniques).

As in the previous case, the reliability coefficients for the performance and Cloze scores were calculated by the Kuder - Richardson Formula 20, a standard measure of internal consistency of response. The performance score reliability (.80) had a standard error of 3.86, which would result in an individual score variation at the 99 percent confidence level of $\pm$ 9.96. The Cloze score reliability (.79) had a standard error of 2.80, which would result in an individual score variation at the 99 percent confidence level of $\pm$ 7.22. Reliability coefficients for the semantic differential instrument and completion times were not calculated.

The Formation of High, Middle, and Low Reading Ability Subgroups

Two of the hypothesis required the formation of subgroups consisting of students who demonstrated different levels of reading ability. Three levels of reading ability (high, middle, and low) were formed.

A procedure paralleling that described in chapter IV was used in forming the subgroups. First, it was noted (see Table 7) that the mean for the Cloze score was 21.02. At the 99 percent confidence level, an individual Cloze score would vary no more than plus or minus 7.2. Considering this, high and low reading ability groups were formed by using the Cloze score mean as a midpoint between the two groups, which were then separated by a 7 point spread. Thus, the high reading ability groups included all students who scored 25 or above on the Cloze test and the low reading ability groups were composed of those that scored 17 or below. The middle ability students consisted of students who scored within the range of 18 and 24. Frequency distributions of each group (high, middle, and low) within each treatment (BOF and high impact graphics) are shown in Tables 8, 9, and 10.

TABLE 8

FREQUENCY DISTRIBUTION OF CLOZE SCORES
HIGH READING ABILITY

SCORE	BOF FREQ.	HIG FREQ.	EXACTLY MATCHED PAIRS
36	1		
35			
34		1	
33			
32	1		
31	2	4	2
30	4	3	3
29		1	
28	3	4	3
27	2	5	2
26	5	5	5
25	3	6	3

TABLE 9

FREQUENCY DISTRIBUTION OF CLOZE SCORES
MIDDLE READING ABILITY

SCORE	BOF FREQ.	HIG FREQ.	EXACTLY MATCHED PAIRS
24	1	6	1
23	3	1	1
22	5	5	5
21	4	2	2
20	4	3	3
19	1	3	1
18	3	2	2

TABLE 10

FREQUENCY DISTRIBUTION OF CLOZE SCORES
LOW READING ABILITY

SCORE	BOF FREQ.	HIG FREQ.	EXACTLY MATCHED PAIRS
17	1	1	1
16	3	4	3
15	3	3	3
14	1		
13	1	1	1
12		1	
11	2	2	2
10	1	3	1
9	2	2	2
8	1		
7		1	
6	2		
5			
4		1	
3		1	
2	1		

Hypotheses Tested

Five hypotheses were formulated and tested for the Food Services portion of the study. A description of each hypothesis and resulting

findings is given in this section. The procedure followed for each was to state the hypothesis, present the statistical techniques used for testing the hypothesis, and cite the findings. Analysis of variance techniques were based on Ferguson's description of one and two way classification.[1] For each experimental hypothesis tested, significance at or beyond the .05 confidence level was used for acceptance.

The first hypothesis pertained to treatment effects on student's performance.

Effects of instruction on performance

Hypothesis one was that students who study high impact graphic course materials would show significantly better performance scores than those who study BOF materials.

A one-way classification, analysis of variance, was used to test the hypothesis. A comparison was made between performance scores for high impact graphic students (mean = 74.13) and BOF students (mean = 71.05). The comparison indicated a significant difference ($F(1,29) = 5.07$, $P < .05$) favoring the high impact graphic students' performance. Thus, the first experimental hypothesis was accepted as being true.

Effects of reading ability on performance

The second hypothesis was that high ability readers would perform significantly better than low ability readers. To test this, students were grouped into high and low reading ability groups depending on their

[1] George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Co., 1971), pp. 208-45.

Cloze test scores. Students who scored above 24 were included in the high reading ability group, and those that scored below 18 in the low reading ability group. The frequency distribution of the Cloze scores for the high and low reading ability groups is shown in Tables 8 and 10. A one-way analysis of variance was used to test this hypothesis. A comparison was made between the performance scores for high reading ability students (mean - 75.72) and low reading ability students (mean - 68.61). The comparison indicated a highly significant difference ($F(1,86) - 22.27$, $p < .01$) favoring the high ability readers' performance. Thus, the second experimental hypothesis was accepted as being true.

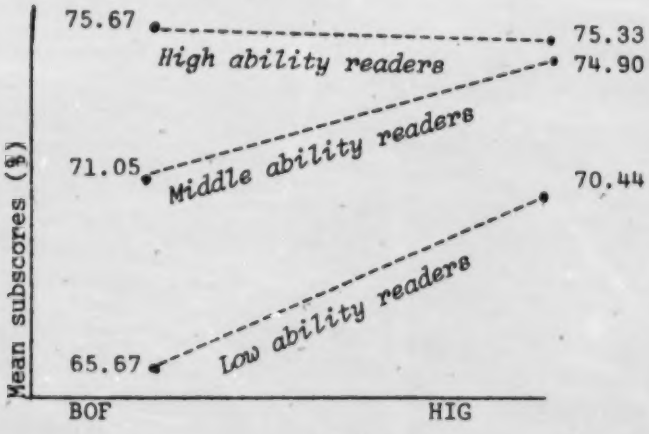
Unique effects of treatments and reading ability levels

The third hypothesis was that high ability readers would show little difference in performance from one treatment to another while middle and low ability readers would demonstrate best performance using high impact graphic course materials and poorest performance using BOF materials. To test this, students in each treatment group were divided into three subgroups depending on their Cloze scores. Within each subgroup and between each treatment group, the Cloze test scores were used to form matched pairs of students. When exactly matched pairs of students' Cloze scores did not exist, the closest possible match was sought. The high reading ability group consisted of best matched students who scored 25 or better on the Cloze test, the middle reading ability group consisted of best matched students who scored within the range of 18 to 24, and the low reading ability group was made up of best

matched students who scored 17 or less.

A two-way analysis of variance was used to test for a significant interaction effect (treatment by reading ability level). A comparison was made of the variability of the difference between the subgroups' performance score means at each level across treatments. This comparison is depicted in Figure 4, where the relative standing of performance score means for subgroups is shown. The variability of differences was not significant ($F(2,114) = 1.42$) and consequently, the third experimental hypothesis was not accepted as being true.

FIGURE 4



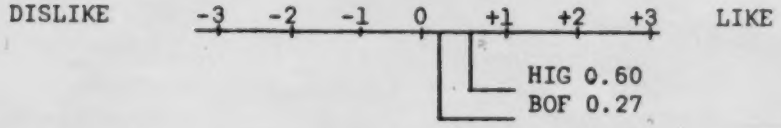
Effects of format on student attitude

The fourth hypothesis was that students who studied the high impact graphic course would display a significantly more positive attitude toward their training materials than those who received the BOF course.

A one-way classification analysis of variance was used to test for a significant difference on the semantic differential instrument scores

between high impact graphic (mean score = 35.99) and BOF (mean score = 32.74) students. Figure 5 shows the relative standing of high impact graphic and BOF students on the original semantic differential scale ranging from plus three to minus three. The comparison indicated a significant difference ($F(1,120) = 5.81$, $P < .05$) in attitudes with the high impact graphics students being the most positive. Thus, the fourth hypothesis was accepted as being true.

FIGURE 5



Effects of format on completion times

The fifth hypothesis was that the completion time in days for students using high impact graphic materials would be significantly shorter than for students using BOF materials.

A one-way analysis of variance was used to test for a significant difference in completion time between the high impact graphic (mean = 100 days) and BOF (mean = 130 days) students. The comparison indicated a highly significant difference ($F(1,67) = 8.95$, $P < .01$) in completion times, with the high impact graphics students requiring the least time. Thus, the fifth hypothesis was accepted as being true.

Summary

In summary, four of the five experimental hypotheses were accepted. Student performance was found to be significantly better on the high

impact graphic course materials than the BOF materials. Able readers were found to perform significantly better on end of course exams than less able readers, students' attitudes toward the high impact graphic material were significantly more positive than those toward the BOF material, and the number of days required for completion were significantly fewer for the high impact graphic students. The hypothesis about the treatment by reading ability level was not supported. As expected, able readers showed little difference in performance on either the high impact graphics or BOF course and less able readers showed better performance on the high impact graphics course, however, the interaction effect of these differences in performance was not significant.

In the next chapter, support of the findings for the sixteen hypotheses (eleven for the Materiel Facility specialists and five for the Food Service students) will be sought through a review of student surveys.

CHAPTER VI

STUDENT OPINION SURVEYS

Introduction

Upon completion of their respective course examinations, students who participated in the Materiel Facilities and Food Service studies were asked to respond to a survey instrument consisting of twenty-five items. In this chapter the interpretation of the survey responses for each study will be given. First, a general overview highlighting the innovative courses will be presented. Then a more specific perspective compares survey results to relevant findings resulting from the hypotheses tested in each study.

For the interested reader, a description of how the survey instrument was interpreted is given in appendixes M, N, and O. Appendix M describes how the survey items are classified into types and subtypes; N reports how the student responses to the survey instrument are regarded and lists each survey item and its pertinent response data, and O describes and lists the frequency of occurrance of arrays and treatment rankings for seven item clusters. Appendix P graphically depicts the percentage of students in each Materiel Facilities group who responded negatively to each survey item. Item numbers are sequenced to show progressive increases in negativity by students in the innovative group (modular BOF). Appendix Q reflects similar information for the Food Service survey.

An Overview of Innovative Courses

The materiel facilities and food service studies each had treatment groups in which innovative textual materials were used. For the Materiel Facilities study this was the modular group and for the Food Service study the high impact graphic group.

From a global perspective, students from the innovative group for each study gave more positive responses to the survey items than their corresponding BOF counterparts. An interpretation of the student responses resulted in the following contentions. The Materiel Facilities conventional course was more positively regarded than the modular course and the modular course was more positively regarded than the BOF course. For the Food Service study the high impact graphic course was found to be more positively regarded than the BOF. Thus, in each study, the innovative courses were found to be more positively regarded than those in the behavioral objective format.

The Materiel Facilities Survey

In this section, analysis will be limited to the Materiel Facilities study and the student responses to the survey items will be viewed from a more specific prospect. Six clusters of items were formed on the basis of objective similarity and are interpreted with respect to the relevant findings that resulted from the eleven hypotheses (see appendix R) tested in chapter IV.

Difficulty of Texts

The first cluster contains six items (1, 5, 6, 7, 8, and 9) that

relate to the difficulty of texts. The following interpretations resulted from student responses to these items.

More students from the BOF course than from either of the others indicated the text materials were difficult considering their present level of training. They also found the BOF version hard to read and difficult to understand. In the opinion of the students, the BOF version contained too many technical terms, had an excessive number of abbreviations, and frequently employed technical terms that were undefined.

More modular text students found their materials too difficult for their present level of training than did conventional students; this seemed related to modular student perceptions of excessive technical terms and abbreviations in their texts.

More conventional than modular students indicated their materials were difficult to understand. This probably relates to conventional student perceptions that their texts are difficult to read.

All subjects shared the view that their materials frequently employed technical terms or acronyms that were undefined; this was expressed by over 60 percent of the students from each group with the difference between groups less than two percent.

The above interpretations of the items had a direct bearing on hypotheses 1, 2, and 3. The perceptions of least difficult materials for conventional, less for modular and greatest for BOF were consistent with an acceptance of the first hypothesis and the rejection of the second and third.

Textual coverage

The second cluster contains four items that relate to textual coverage. These are items 2, 3, 4, and 10. The following conclusions were derived from student responses to these items.

BOF students believed, more so that modular students, that the course materials were deficient in illustrations and foldouts, and that behavioral objectives were inadequately covered in the text and poorly tested. BOF and modular course materials both depend heavily on behavioral objectives as study guides, while conventional objectives were not rigidly organized and thus could not be meaningfully compared here. This interpretation was consistent with the first hypothesis in that a more adequate coverage of course objectives and better illustrations and foldouts describe conditions that most likely would result in an increase in student performance.

Relevance of Texts to Job

BOF and modular students expressed less satisfaction than conventional students on several issues: (1) they believed that their courses contained more material than needed at their particular stages in their Air Force careers, (2) they believed that their courses contained more material than needed to do their jobs (over 50% of the topics discussed were said to not relate to their present jobs), and (3) they considered their courses to be unrealistically complex. These students also felt that few of the different types of equipment discussed were used in their jobs, and that few of the tasks described were ever performed.

In short, a larger percentage of students indicated that conven-

tional course materials were more closely related to the actual job than did students in modular or BOF versions.

In contrasting modular and BOF students, it was learned that more modular than BOF students regarded the scope of their material as too broad. Modular students also felt that their jobs required less exposure to the equipment discussed in their texts.

In short, BOF students, more so than modular students, agreed that most of the topics discussed in the course did not relate to the job, that the tasks described were more complex than those on the job, and that many of the tasks were rarely perfcrmed.

The above speculations support hypothesis one in that the lower performance found for the BOF students is compatible with a larger percentage from that group than from the modular group perceiving their course to be overly complex and unrelated to the job performed.

Difficulty of course examinations

The fourth cluster of items related to the difficulty of course examinations and consisted of items 21 and 22. What follows is an interpretation of student responses.

Many modular students, fewer BOF students, and still fewer conventional students indicated that they had difficulty understanding the course examination questions. Most students regarded their test as being somewhat difficult. It was noted that less than 7 percent of any group indicated that the course examination was too easy to really test one's knowledge of the course materials.

The contention that, fewer conventional students perceived the course examination as being difficult than did students in either of the other groups, is consistent with the second and third hypotheses. It is inconsistent with the first in that the rank order on exam performance was conventional highest; modular next highest; and BOF, lowest.

Course examination coverage

The fifth cluster of items pertained to the course examination coverage and consisted of items 19, 23, and 25. A greater percentage of BOF than modular students and still fewer conventional students indicated that the course examination asked questions about material not contained in the texts. This interpretation is consistent with the findings for hypotheses 1, 2, and 3 in that the performance score rank orders agree with the responses. The next two observations were of particular importance. First, more than half of the modular and BOF students, but only a fifth of the conventional students indicated that most course examination questions did not come directly from the volume review exercises. Second, a greater percentage of students from the conventional course, fewer from the modular course, and fewest from the BOF indicated that they prepared for the course examination by studying only the volume review exercises or only the text. As a result of these two observations, an analysis of the relationship of volume review exercises and course examinations was made for each course version.

It was found that a 44 percent repetition of identical items existed between the conventional course examination and its correspond-

ing volume review exercise. There was no such overlap in either the BOF or the modular examinations and their corresponding volume review exercises. These findings bear heavily on the second and third hypotheses and could very well account for the unexpected reversed findings for these two hypotheses.

Course examination relevance to the job

The sixth cluster of items pertained to course examination relevancy to the student's job. The cluster consisted of items 20 and 24. It was noted that a greater percentage of BOF and modular students than conventional students indicated that the course examination neither covered the most important concepts relating to their jobs, nor tested subjects important to their jobs. The above interpretation would most likely have bearing on the rejection of the seventh and eighth hypotheses as the student's attitude about the course materials would be affected by their perceptions of the adequacy of course examinations.

The Food Service Survey

This section analyses the survey for the food service study. Again, as in the proceeding section, student responses to survey items will be viewed from a specific prospect. Six clusters of items are interpreted and compared to relevant findings that resulted from hypotheses (see appendix R) tested in chapter V.

Difficulty of texts

The first cluster contains six items that relate to text difficulty (items 1, 5, 6, 7, 8, and 9). The following speculations resulted from

an interpretation of the student's responses to these items.

Generally speaking, the BOF course was considered as being more difficult than the high impact graphic version. More students from the BOF course indicated the text materials were difficult considering their present level of training. They also found the BOF difficult to understand and hard to read. In the opinion of the students, the BOF contained too many technical terms and had an excessive number of abbreviations. However, technical terms were considered as being more frequently undefined in the high impact graphic course. In spite of this, this version was considered as being generally less difficult. This interpretation is consistent with the findings for hypotheses 1, 3, 4, and 5.

For hypotheses 1, 4, and 5, the findings of significantly better performance, more positive attitude, and quicker completion time by high impact graphic students was consistent with the survey interpretation that this course was generally considered to be less difficult. For hypothesis 3, the higher (but not significant) performance by less able readers on the high impact graphic version was consistent with the survey interpretation that this course was easier to read.

Textual coverage

The second cluster contains four items that relate to textual coverage; items 2, 3, 4, and 10. The following conjecturs were drawn from an interpretation of the student responses to these items.

With respect to the coverage of stated objectives, the high impact graphic course was generally considered to be more adequate than the

BOF. More high impact graphic than BOF students had the opinion that the questions at the end of each objective actually tested the objective. Also, BOF students believed that there had been inadequate use of illustrations and foldouts.

To briefly summarize, the BOF seemed to be covering the right things but was lacking in the manner of presentation while the high impact graphic course had a better presentation but was lacking in coverage. This interpretation would most likely have bearing on the first and fourth hypotheses as a course that is better presented would result in higher performance and be better received.

Relevance of texts to job

The third cluster of items related to the relevance of textual materials to the actual jobs performed by students. This cluster consisted of items 11, 12, 13, 14, 15, and 16.

BOF students believed that their course contained more material than needed at their particular stage in the Air Force and more material than needed to do their jobs (over 50 percent of the topics discussed were believed to be nonrelated to their jobs). On the other hand, high impact graphic students felt that few of the different types of equipment discussed were used on their jobs, and that few of the tasks described were ever performed. To briefly summarize, the BOF course seemed to have too much coverage with respect to the job while the high impact graphic course had too little. This interpretation would most likely have some bearing on the fifth hypothesis as completion time is related to the amount of material covered.

Difficulty of course examinations

The fourth cluster consisted of items 21 and 22 and related to the difficulty of the course examinations.

With respect to examination difficulty, BOF students considered their examination as being too easy to test their knowledge of the material while the high impact graphic group had more difficulty understanding the questions. It is noted that the percentage of students from the respective courses voicing this opinion was relatively small (less than 21 percent for any course). Consequently, the interpretation of these items have little, if any, bearing on the hypotheses.

Course examination coverage

The fifth cluster of items pertained to the course examination coverage and consisted of items 19, 23, and 25.

BOF students believed that the course examination asked questions about materials not covered in the text. When preparing for the course examination, BOF students also believed examination questions came directly from the volume review exercises and consistent with this belief they undertook a less comprehensive review of course materials prior to taking their exams. The first interpretation that exam questions were not covered in the text would be supportive of a positive attitude toward the course materials and consistent with the fourth hypothesis. However, the belief that examination questions came directly from the volume reviews would most likely have the opposite effect.

Course examination relevance to job

The sixth cluster of items pertained to the course examination relevancy to the student's job. The cluster consisted of items 20 and 24.

Although the high impact graphic material was considered less related to the job than the BOF, the high impact graphic course examination was considered to be better related to the job than that of BOF. High impact graphic students believed that the course examinations covered the most important concepts relating to their job and that most examination questions were about topics important to their job. This interpretation would most likely have a bearing on the fourth hypothesis as acceptance of the course materials is related to student feelings about the appropriateness of the course examination.

Summary

A review and interpretation of the student survey was made for students in the Materiel Facilities and Food Service courses. First, an overview of the survey items was presented. In general, it was found that innovative courses were more favorably regarded than BOF courses. Then a description of the item interpretations as they related to the hypotheses tested in chapters 4 and 5 was given. In most cases, it was found that the interpretations of survey items were consistent with and supportive of one or more of the hypotheses.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Introduction

The preceding chapters have presented an analysis of innovative correspondence materials in two Air Force career fields. In the apprentice Materiel Facilities Specialist's course, a three-way comparison was made between conventional texts, materials in the BOF, and an innovative modular BOF text. In the Food Service Specialist's course, a comparison was made between texts in the BOF and those using the innovative high impact graphic technique. This chapter summarizes the findings of each of these studies and states the conclusions drawn. It is important to recognize that these conclusions are based only on the two career development courses studied; therefore, generalizations beyond what has been experimentally observed should be made with caution. The findings suggest, however, that the innovative materials studied have varying degrees of value in terms of student achievement and attitude with potential for further application in other Air Force career specialties.

Restatement of Hypotheses

The experimental hypotheses as stated in chapter I were as follows:

a. That students who receive instruction by way of modified CDCs (newly developed) will perform significantly better on course

examinations than those who receive instruction by conventional texts.

b. That high ability readers will perform significantly better than low ability readers on each respective field test course examination.

c. That, on the Food Services course examinations, high ability readers will show little difference in performance depending on training media while low ability readers will perform significantly better using the contemporary narrative/enhanced graphics version.

d. That, on the Materiel Facilities course examinations, high ability readers will show little difference in performance depending on training media whereas low ability readers will demonstrate poorest performance using conventional texts, intermediate performance with BOF, and highest performance using modular BOF texts.

e. That students receiving modified text instruction will display a significantly more positive attitude toward their training than those who receive instruction by conventional CDCs.

f. That the innovative texts will be completed in a shorter average time than current conventional and BOF volumes.

Each hypothesis was tested using analysis of variance techniques with a .05 significance level (chance occurrence no greater than 5 times in 100) as the criterion for acceptance.

Materiel Facilities Course Study

In the Materiel Facilities course (CDC 64531), a three-way comparison of conventional texts, the BOF, and the innovative Modular BOF was conducted. The Modular BOF involves chapters that may be studied in any

order (modules), liberal illustrations, and frequent summarizing notes. A minimum of 100 students were enrolled in each group with usable data yielded as follows: conventional, 75; BOF, 75; and modular BOF, 83.

Student subscores were then compared by test format with these mean results: conventional, 74.31; BOF 69.91; modular, 69.95. The mean score of each group using behavioral objectives was significantly lower than that of the conventional group. On the basis of that finding, hypothesis "a" was rejected. While unexpected, this is not difficult to explain. The advantage of behavioral objectives lies in their ability to focus curriculum planning and to communicate instructional intent to the student. Research has not consistently shown that behavioral objectives result in greater student achievement. Further, the opinion survey conducted as a part of this study suggested that students in the BOF and modular courses felt inadequately prepared for their course examinations by each volume review exercise (VRE). Later investigation showed a 44 percent repetition of VRE and course examination items in the conventional course, but no such overlap in either the BOF or innovative modular version. This test overlap may have biased findings associated with the conventional materials.

The average subscores of low reading ability students was 68.08, and that of the high ability group was 73.75. The 5.67 percentage point difference in subscores was significant, and hypothesis "b" was accepted. Student reading ability was again shown to be a student characteristic significantly affecting test performance.

Hypothesis "c" did not apply to the Materiel Facilities course. When students were stratified according to reading ability, both

high and low groups performed best using conventional texts, poorest with the BOF, and intermediately using modular BOF materials. There was no significant interaction effect between any group, therefore, hypothesis "d" was rejected. While the innovative modular group did not out perform the conventional group as hypothesized, its performance over the BOF group was significant and should be noted.

Differences in student acceptance of the three textual versions were not significant, therefore, hypothesis"e" was rejected.

The average number of days required for course completion was 66 for the conventional version, 75 for the BOF, and 72 for the modular format. These differences were not significant, and hypothesis "f" was rejected.

Food Service Course Study

In the Food Service career field (CDC 62250), a comparison was made between students using a text in the Behavioral Objective Format (BOF) and students using the newly developed high impact graphic text. Of 106 students enrolled in the BOF, 60 completed in time to yield usable data; of 109 in the high impact graphic version, 71 produced usable data. Performance was measured by subscores on the examination items common to both versions. Student receptiveness to texts was obtained using the semantic differential technique (polar adjectives, such as "deep -- shallow"). Reading comprehension was measured by scores on a fill-in-the blank examination, a procedure called the Cloze technique. Each hypothesis was then tested separately.

Students were again divided into high and low reading ability groups and common item subscores were compared. The low reading ability group averaged 68.61 correct; the high reading ability group 75.72. The 7.11 percentage point difference was statistically significant, therefore, the hypothesis "a" was accepted.

Students were then compared by textual treatment groups while disregarding reading ability. Subscores for the BOF students averaged 71.05, compared with 74.13 for the high impact graphic students. The 3.08 percentage point performance difference by students using the high impact graphic text was significant, therefore, hypothesis "b" was accepted.

Next, students were compared using different textual formats while considering reading abilities in a treatment by level design. As hypothesized, able readers performed well using either text while low ability readers showed some performance increase using the high impact graphic materials. However, this increased performance was not significant and caused rejection of hypothesis "c".

Hypothesis "d" did not apply to the food service course.

General student acceptance of this innovative high impact graphic material was significantly greater than that of the BOF based on semantic differential test scores. Hypothesis "e" was therefore accepted.

Course completion time was defined as the time between course package receipt by the student and the date of course examination. The BOF students required an average of 130 days to complete, whereas the high impact graphics students averaged 100 days. This difference is significant, and hypothesis "f" was accepted.

Conclusions and Recommendations

Several observations and conclusions can be drawn from this field test. First, the procedures used to gather data worked, and could be used again to evaluate other innovations as the need arises. Second, when the high impact graphic text was used by students of limited reading ability, it worked as anticipated and worked well. This format could be usefully applied to other career development courses in which reading problems are known to exist. Finally, though the modular approach did not demonstrate all anticipated performance advantages, it did show slight improvement over the present BOF. The difference is enough to justify continued development to expand use of the modular concept in selected areas.

The following recommendations can be derived from this study: First, that the Extension Course Institute apply the field study methods developed here to the validation of other innovations in its correspondence program. Second, that Air Training Command preparing agencies be encouraged in the extensive use of illustrations in Career Development Courses, particularly when populations of low-ability readers are believed to exist. Finally, that self-contained study modules be developed whenever this is compatible with the subject matter, to facilitate direct text support of on-the-job training.

APPENDIXES

Appendix A

Conventional Text
(Materiel Facilities Course)

Supply Cataloging Publications

RECORDS FOR a recent calendar year show that the Air Force had approximately two million active cataloged items in its inventory. These items, it is estimated, were involved in the processing of 29.3 million supply transactions between depots and bases. Furthermore, this figure does not include the innumerable transactions that were made between the hundreds of base level accounts and their thousands of local customers. Every one of these transactions requires accurate communication of specific supply data from one activity to another. Unless there is a common language between the user on one hand and the supplier on the other, it is almost impossible for an effective transaction to occur at any level. To meet this need for a common language relating to items of supply, the Department of Defense and the Air Force prepare, publish, and distribute the various cataloging publications included in the USAF supply cataloging system.

2. The major aim of all supply management functions is to provide each individual or organization with the items needed, when they are wanted, and in the condition, quantity, and location required. The different kinds of cataloging publications used by the Air Force provide supply personnel and their customers with information and data to insure positive identification and efficient management of supply items. Supply catalogs contain orderly listings of the millions of active Air Force items. Other kinds of publications in this system contain information and instructions which help you to locate and effectively use the item identification and management data included in the stock list and supply catalog listings. You will find that the knowledge you gain from your study of supply cataloging publications will be used daily in the performance of your duties.

1. Federal Supply Item Classification, Identification, and Cataloging

1-1. In order to use supply catalogs, you need to first understand the basic principles of property classification and item identification. Materiel and supplies in tremendous quantities are required by the military forces of the United States both in peacetime and war. Billions of dollars, thousands of pieces of equipment, and millions of parts and other types of supplies must be managed. For many years, each of our military departments used its own system of management to classify, identify, describe, and catalog items of supply. Now, under the Federal (Defense) Cataloging Program, the military forces and other Government agencies use the same system.

1-2. **Federal Supply Classification.** When you consider the vast number of items in Department of Defense (DOD) supply systems and the worldwide scope of operations, it is evident that supply managers cannot manage their systems on an item-by-item basis. To provide a manageable system, items must be divided into "family" groups. Management of our complex DOD supply inventories, then, begins with the classification of all items.

1-3. The Federal supply classification (FSC) system provides an organized structure for grouping and relating all the different kinds of items on a "commodity" or "class-of-item" basis. The FSC system is designed to serve the functions of supply and is sufficiently comprehensive in scope to permit the classification of all items of personal property. (Personal property is briefly defined as all commodities other than real estate.) This FSC structure, which includes approximately 76 groups, subdivided into about 585 classes, could be expanded to 99 groups with 99 classes within each group if necessary.

1-4. The principle of commodity classification provides for the grouping of items under names or titles according to their use or purpose. FSC groups, just as the separate departments in a large department store, contain such major groupings of commodities as clothing, tires and tubes, photographic equipment, furniture, etc. Commodity classification further provides for the breakdown of commodity groups into classes as necessary. Each class consists of commodities which are relatively similar in one way or another. For example, the group (FSG 5100) entitled "Hand Tools" is broken down into classes entitled "Hand Tools, Power Driven" (FSC 5130), etc. The items within a class may be related in respect to their physical or performance characteristics. In some classes, the relationship of items may be that they are requisitioned or issued together or that they are grouped together for supply management purposes.

1-5. In addition to name or title, commodity classifications are identified by assigned numerical codes. A 4-digit coding structure is used for this purpose. The first two digits of the FSC code number identify the group, and the last two digits identify the classes within the group. For example, the 4-digit codes assigned to classes in Group 15 begin with "15" (1510, 1520, 1530, etc.), while those assigned to Group 53 begin with "53" (5305, 5306, 5307, etc.). Note that the last two digits of the FSC code identify a specific class within the group, as indicated for the following class breakdowns in Group 53, Hardware and Abrasives:

Class 5305—Screws
Class 5306—Bolts
Class 5307—Studs
Class 5310—Nuts and Washers

1-6. Code numbers assigned to Federal supply groups begin with 10 and continue consecutively through 99, except for certain unassigned numbers, as shown in the following partial list of FSC groups:

Group
85 Toiletries
86 Unassigned
87 Agriculture Supplies
88 Live Animals
89 Subsistence
90 Unassigned
91 Fuels, Lubricants, Oils, and Waxes
92 Unassigned
93 Nonmetallic Fabricated Materials

Unassigned numbers, such as 86, 90, and 92, can be used to identify any additional commodity groups that might be established because of technological advances or other desired changes.

1-7. Code numbers are so assigned to classes within a group as to make it possible to expand the number of classes as this becomes necessary. In most groups, gaps have been left between some adjacent class code numbers so that new classes may be inserted later in logical sequence. To illustrate, let us consider Group 34, Metalworking Machinery. The classes in this group begin with 3405; skip to 3410; continue with 3411, 3412, 3413, 3415, 3416, 3417, 3418, and 3419; skip to 3422, then to 3424; and so on. Gaps, such as 3420 and 3421, can be used for later expansion if necessary.

1-8. Item Identification. In cataloging and supply operations, identification of items must be positive and accurate so that the identification of one item cannot be confused with any other similar or like item. Federal item identification consists of the minimum data necessary to establish the essential characteristics of an item and to differentiate it from every other item of supply. Item identification includes four principal elements of data: (1) item name, (2) descriptive data, (3) Federal item identification number, and (4) Federal stock number.

1-9. *Item name.* The item name is the name approved under the Federal Cataloging Program for official use throughout the entire military defense systems. After necessary research, a single item name is selected for each article so that all DOD activities can speak the same language. In other words, they use the same name for the same article. The item name answers the question, "What is it?" Depending on the nature or kind of item, the item name may consist of a basic name or a basic name with modifiers.

1-10. The basic name may be a noun word, such as RESISTOR; or it may be a noun phrase, such as CLEANING COMPOUND, PANEL ASSEMBLY, etc. Modifiers are necessary where different kinds of items have the same basic name such as CAMERA, STILL PICTURE; CAMERA, MOTION PICTURE; CAMERA, TELEVISON; etc.

1-11. *Descriptive data.* While the item name tells what the item is, additional descriptive data is usually necessary to identify each item from every other item of supply. The complete description required to identify an item, then, consists of the item name, followed by descriptive information. For example, several items may have the same item name but may differ in size, in color, or in some other way.

Appendix B

Behavorial Objective Format
(Food Services Course)

Cooking Methods

TO COOK IS to expose foods to the action of heat in order to make them more digestible. There are various ways of applying heat to foods. The method used depends a great deal upon whether the item is tough or tender. If the item is tough, a lengthy cooking period is required to make the item more appetizing and digestible. If the item is tender, a faster cooking measure is used.

2-1. Cooking Methods

Cooking is performed by two basic methods—dry heat and moist heat. One of these is used regardless of the product cooked, be it meat, vegetable, or pastry. We will discuss these two cooking methods briefly in the following paragraphs and, later on, go into more detail when we cover the preparation of individual foods.

203. Indicate whether statements pertaining to dry-heat cooking methods are true or false.

Dry-Heat Cooking. When you cook with dry heat, no liquid is added. In most cases, the product itself supplies enough fat and/or juices to keep it from burning. Dry heat is used when cooking tender cuts of meat, fish, young poultry, some types of vegetables, and most pastry and bread products. Dry-heat cooking procedures are explained in the following paragraphs.

Roasting, one of the more popular cooking procedures, is done in an oven. The food being roasted must be kept uncovered, otherwise the food will steam. The term "roasting," although essentially the same as baking, generally applies to meat items, whereas "baking" applies to fish and dough products.

Broiling is cooking by direct heat over coals or under gas flame or an electric heating unit. This cooking procedure is used mainly in the preparation of meat, poultry, and fish. It is a very quick and simple method, but it is limited to the cooking of very tender meat cuts, such as steaks and chops.

Pan or griddle broiling is cooking on top of the range in a frying pan or on a griddle, using for grease only the fat of the meat itself.

Pan frying is done with just enough added fat (grease) to cook the food. Only certain foods are adapted to pan frying. Do not use this cooking method unless it is prescribed by the recipe.

Deep-fat frying is cooking food by completely covering it with hot fat. In deep-fat frying, foods are cooked quickly enough to prevent their absorbing any of the cooking fat. Holding the cooking fat at the correct temperature is very important when using this method. Too high a temperature causes the product to become hard and dry; too low a temperature allows the product to absorb the cooking fat.

Recommended dry-heat cooking temperatures are as follows:

Broiling	450° to 500° F.
Roasting (meat)	300° to 350° F.
Frying, deep-fat or pan	375° F.

Exercises (203):

Indicate whether the following statements are true or false by placing a T or an F in the blank:

___ 1. Liquid is not added when cooking with dry heat.
___ 2. Roasting is done in a broiler.
___ 3. Deep-fat frying is cooking food by partially covering it with hot fat.
___ 4. The recommended temperatures for roasting most meats are 300° to 350° F.

204. Identify statements concerning moist-heat cooking as either true or false.

Moist-Heat Cooking. Moist-heat cooking is the process of cooking the food in a liquid, usually water. The moist-heat cooking methods described in the following paragraphs are generally used for less tender cuts of meat and for most vegetables.

Simmering is cooking in liquid that is held just below the boiling point. When the temperature is right for simmering, the bubbles of steam that rise from the bottom of the container disappear before reaching the surface of the water.

Braising is similar to simmering. The food is first browned in a small amount of fat and is then simmered in liquid until done. Braising provides long, slow cooking and is recommended for the less tender cuts of meat.

SECTION B, Receiving Procedures

Hundreds of items arrive at the receiving docks daily. Many of these items are urgently needed by our customers while others are needed to replace stock that has already been issued. THE POINT IS—we need to get those items processed and into the hands of our customers or in their proper storage location as soon as possible.

That makes sense, now just what do I need to know to get that job done?

My book says that we need to achieve these objectives.

1. **Upon receipt of supplies, state the required entries on the receipt document and identify the correct procedures for in-checking those items.**
2. **Given a specific receiving situation, select the correct type of receipt to process.**
3. **Identify the procedures for processing a Receipt Due-In Card.**
4. **Identify the procedures for preparing an Extract Receipt Document.**
5. **Identify the procedures for processing a receipt in any of the following conditions:**
   a. **Serviceable.**
   b. **Unserviceable.**
   c. **Partial.**
   d. **Excess.**
   e. **Overage.**
   f. **Shortage.**
6. **Given specific examples of receipts that have been processed, identify by TRIC/DIC the output documents that may result.**

Hold it! What in the world is all this stuff about TEX code P and Z?

What do the TEX code letters P and Z mean?

These codes are used to help identify the reasons an item is received in an unserviceable condition. **The letter P identifies an item that probably received damage while in transit. The letter Z identifies items that are received with latent (hidden) defects which were probably caused by the manufacturer.**

If the condition of the receipt is unserviceable (reparable), the remote operator can input the due-in card by processing it through the 1068 Remote Card Reader. If the condition is unserviceable (condemned), the receipt due-in card and the TRM input should be sent to ADPM/PCAM for input.

OUTPUT DOCUMENTS

The output document for an unserviceable (reparable) receipt is:

In the case of the unserviceable (reparable) receipt, the output document is **normally DD Form 1348-1, Management Notice 1046 (unserviceable), TRIC REC,** (see fig. 5-18).

The property and output document should be sent to the unserviceable storage area and held there until disposition instructions are received.

If you have processed an unserviceable (condemned) receipt, your output product is **DD Form 1348-1, transfer to Defense Property Disposal Office (DPDO),** as shown in figure 5-19.

The output document for an unserviceable (condemned) receipt is:

This output document can be identified by Document Identification Code (DIC) A5J or A5K. Upon receipt of the A5J or A5K output, forward both the property and the document to the supply inspector. The inspector signs or places his stamp and date in block V of the DD Form 1348-1. He then forwards everything to the Pick-up and Delivery Section for final processing to DPDO.

Let's review the procedures for processing an unserviceable receipt.

KNOWLEDGE FEEDBACK 23

1. Transaction Exception Code P in card column 51 of the receipt due-in card indicates that
   a. the receipt has a latent defect.
   b. the receipt has been misidentified.
   c. the receipt was damaged while in transit.

2. What material condition code is entered in card column 7 of the receipt due-in card for an unserviceable receipt?
   a. H.
   b. F.
   c. A.

3. What is the output document normally received as a result of processing a reparable receipt?
   a. Notice to stock document.
   b. Due-out release document.
   c. Management Notice 1046 (unserviceable).

4. Which of the following codes identifies a transfer to DPDO?
   a. A5J.
   b. SHP.
   c. REC.

5. What is the TRIC of the input document for a transfer to DPDO?
   a. A5K.
   b. REC.
   c. TRM.

Check your responses at the back of this volume.

RECEIPT PROCESSING (overage/shortage)

Something is bugging me. I know what to do if the item received is misidentified, damaged, or not in a sealed container. But what do I do if the quantity doesn't agree with the receipt document?

"Why are those columns blank?" asked Sabrina. 74

"They get filled in later," said Larry. "Joe, could you explain this? I've got to finish updating all these 147s."

Joe nodded. "Would you like the full story on the Senior Cook's Requisition?" he asked Sabrina. "It's one of our most important forms."

"Why?"

"Two reasons. First, you must have it properly filled out to get the food for the next meal. And second, it's the ONLY basis for figuring the monthly food costs--and you can guess what budgeting would be like if you didn't know those costs."

"Pure chaos." Sabrina shuddered. "All right, tell me about it."

"Well, the senior cook prepares the first five columns--A through E -- and the storeroom man fills in the last two--F and G--after the senior cook closes out the form. I won't talk about F and G, because the senior cook doesn't have to do them."

He looked into the desk drawer. "There should be a copy of that chart in here--ah, here it is. It's another one of our training aids."

IS THE SENIOR COOK'S REQUISITION GIVING YOU GREY HAIRS?

STOP WORRYING--

HERE'S WHAT YOU NEED TO KNOW:

You deal with AF Form 148, Senior Cook's Requisition, in two phases:

PHASE 1. Before the meal, when you use it to take food from the storeroom. This involves columns A, B, and C.

PHASE 2. After the meal, when you account for the food you took out. This involves columns D and E.

PHASE 1. DRAWING YOUR SUPPLIES

Though no money changes hands, this is sometimes called "purchasing" or "buying." You will need:

COOKIE DOESN'T LIVE HERE ANY MORE

4.

When you finish this chapter, you should be able to:

Select from situations involving the two types of sanitation inspections, those situations in which the conditions inspected are satisfactory.

Select from situations involving personal cleanliness and health standards, those situations in which the standards are met.

"Lt Silver wants somebody to write something on sanitation inspections and personal standards," said Sgt Fivestripe, setting down his coffee cup. "She wants to be sure everybody knows the information--especially since we're trying to get the Hennessy Trophy."

"Hennessy Trophy," said Ellen Smart thoughtfully, thinking of Dave Fastburner's *From Homer to Hennessy* article.

"Do I hear any volunteers?" asked Fivestripe." "I'll do it," said Ellen Smart and Nell Newcome at the same time.

"I need to review the information anyway," added Nell, "Since I'm working towards my 5 level, and shift leaders have to know all that."

"Why don't you do it together?" said Fivestripe. "Do whatever you want with it--an illustrated booklet, maybe."

Ellen and Nell looked at each other.

"Between you, me, and the duplicating machine," said Nell, "I think we could."

"Be sure to include both the medical inspection and the supervisor's inspection," said Fivestripe. "And remember, these inspections include facilities, operations, and personnel."

"Right," said Nell. "We'll conclude with personal cleanliness and health standards. Next week you'll have the booklet."

ARE YOU ON DUTY TODAY? IF SO, I'LL START WITH YOU?
NO, I JUST DROPPED BY
THAT SGT MARVEL- HOW DOES ANYBODY PASS HER INSPECTION
BY MAINTAINING THE STANDARDS! IF FACILITIES, OPERATIONS, AND PERSONNEL ARE IN PROPER CONDITION, THEY CAN PASS ANY INSPECTION!
A GOOD FOOD SERVICE SPECIALIST TAKES PRIDE IN HIS WORK, SO HE MAINTAINS PROPER STANDARDS OF PERSONAL HYGIENE ALL THE TIME!
I ALWAYS DID WASH MY HANDS EVERY DAY, BUT ALL THESE NEW RULES...
THEY'RE IMPORTANT! GOOD PERSONAL HYGIENE DOES TWO THINGS. IT HELPS KEEP THE COOK HEALTHY, AND IT HELPS PREVENT THE SPREAD OF FOOD POISONING ORGANISMS
LIKE STAPHYLOCOCCUS, CLOSTRIDIUM, AND SALMONELLA!
ALL THESE WORDS!
THESE STANDARDS OF PERSONAL HEALTH AND CLEANLINESS FALL INTO THREE GROUPS: GENERAL HEALTH, CLEANLINESS AND APPEARANCE, SANITARY MANNERS, AND WORKING HABITS.

INTRODUCTORY INFORMATION

DO NOT USE THE MACHINE-SCORED ANSWER SHEET FOR THIS PAGE

Please fill in the following information in the blanks that are provided or circle the appropriate letter:

1. How long have you been in the service? ____ years, ____months.

2. How old are you? _____years.

3. What is your ethnic affiliation?

   a. Caucasian
   b. Oriental
   c. Black
   d. Spanish Surname
   e. American Indian (including Aleuts and Eskimo)
   f. Other, please specify _____.

4. Indicate your present educational level from the four choices below.

   a. Non-high school graduate
   b. GED - non-high school graduate
   c. High school graduate
   d. Technical school graduate (not USAF)

5. Indicate your present educational level from the five choices below.

   a. No college work
   b. Some undergraduate work at college level
   c. Associate degree
   d. Bachelors degree
   e. Post-graduate degree

6. Please indicate your sex:

   a. Male
   b. Female

7. Are you married?

   a. Yes
   b. No

8. How many dependents do you have (including spouse)?

   a. None
   b. One
   c. Two
   d. Three or more

PROCEED TO PART I ON NEXT PAGE

Appendix F

ECI COURSE RECEIPT CARD

I received my ECI Course _____ package on: (Enter date of receipt)

Print Name (last, initials)	SSAN
This card is being sent to a cross section of students to determine the average number of days needed to complete ECI courses. It will also provide us with mail transit time information. The code number below identifies your enrollment for statistical purposes only. The information on this card has no other bearing on your course participation. Please return immediately.	Privacy Act Statement 1. Authority: 44 USC 3101 2. Principle Purpose: To determine date of course package receipt by ECI students. 3. Routine Uses: Statistical purposes. Students name and SSAN will not be used in any formal research report. 4. Disclosure: Voluntary. Name and SSAN are requested solely to ease matching course receipt data with actual enrollment dates. May 1976
Enrollment Code	

ECI
GUNTER AFS, AL 36118

POSTAGE AND FEES PAID
DEPARTMENT OF THE AIR FORCE
DoD-316

U.S.MAIL

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

ECI/EDV

GUNTER AFS AL 36118

NOTICE

TO

OJT MONITOR

The student to whom this course package is addressed is participating in an evaluation of ECI course materials. This evaluation requires that we gather certain information from students as they progress through the course. We are trying to determine how long (in hours and minutes) that he or she spends working on these materials. The attached forms provide a convenient method for keeping a record of this information. Feel free to duplicate these forms locally if there is insufficient room on those provided. Please ask the student to jot down the date and time spent during each study session. We also ask that the student be as accurate as possible as the success of this evaluation depends on his cooperation.

The data obtained will be used for statistical purposes only and will have no other bearing on the individual's participation in this course. Although we have asked the student to enter his name on the attached forms, this is for record keeping purposes only. The student will in no way be identified in any final report regarding this evaluation.

There may be other versions of this course on your base, perhaps in the WAPS library. It is imperative that the student DOES NOT use ANY OTHER course materials other than those contained in this course package.

The student will be asked to turn in these completed time forms at the time he takes his course examination. Thank you for your cooperation.

Appendix H

Demographics by Course Treatment (Materi l Facilities)

Group	Conventional	BOF	Modular	Total
Race:				
White	52	51	58	161
Black	17	17	16	50
Oriental	3	1	3	7
Spanish	1	1	5	7
Indian	0	1	0	1
Other	1	3	1	5
Missing data	1	1	0	2
Totals	75	75	83	233
Sex:				
Male	58	49	64	171
Female	16	25	19	60
Missing data	1	1	0	2
Totals	75	75	83	233
Education:				
Did not finish high school	15	13	16	44
High School Graduate	43	45	46	134
Some college	13	15	16	44
Associate Degree	1	0	3	4
Bachelor's degree	1	1	1	3
Post Graduate Work	1	0	0	1
Missing data	1	1	1	3
Totals	75	75	83	233
Marital status:				
Married	16	21	21	58
Single	58	53	60	171
Missing data	1	1	2	4
Totals	75	75	83	233
Dependents:				
Yes	17	19	23	59
No	58	56	60	174
Totals	75	75	83	233

Appendix I

Demographics by Category and Treatments (Food Services)

Group Category	BOF Resident Population	BOF Non-Resident Population	HIG Resident Population	HIG Non-Resident Population	Total
Race:					
White	38	11	33	20	102
Black	3	4	6	7	20
Oriental	0	0	0	0	0
Spanish	0	0	0	0	0
Indian	0	1	3	0	4
Other	0	2	1	0	3
Missing Data	1	0	1	0	2
Totals	42	18	44	27	131
Sex:					
Males	33	18	34	20	105
Females	9	0	10	7	26
Missing Data	9	0	0	0	0
Totals	42	18	44	27	131
Education:					
Did not finish High School	1	0	0	1	2
High School Graduate	32	11	29	20	92
Some College	8	4	10	5	27
Assoc. Degree	1	1	1	0	3
Bach. Degree	0	1	0	1	2
Post Graduate Work	0	1	0	0	1
Missing Data	0	0	4	0	4
Totals	42	18	44	27	131
Marital Status:					
Married	5	8	3	14	30
Single	37	10	36	13	96
Missing Data	0	0	5	0	5
Totals	42	18	44	27	131
Dependents:					
Yes	4	0	6	1	11
No	38	1	37	0	76
Missing Data	0	17	1	26	44
Totals	42	18	44	27	131

Appendix J

Cloze Test

The subject matter in each of the following paragraphs is directly related to your Air Force specialty. Selected words were left out of the paragraphs, and blank spaces were placed where the words were removed. Your task will be to fill in the blank spaces with the word which you feel best completes the meaning of the sentence. Follow these simple steps:

1. PRINT only ONE word in each blank.
2. Try to fill in every blank. Don't be afraid to guess.
3. You may skip the hard blanks and come back to them when you have finished the easier ones.
4. PRINT neatly.

After you have filled in each blank with the word you think would best fit, check your paper for completeness and turn this booklet (with student survey answer sheet) in to your test administrator.

SHIPMENTS

The directed shipment is the result of base supply receiving shipping orders or directives from agencies such as Air Force Logistics Command, General Services Administration, or Defense Supply Agency. The *directed* shipment can be identified *by* Document Identifier Codes A2x *and* A4x. Nondirected shipments are *those* that result from local *management* decisions. This type of *shipment* is identified by Transaction *Identification* Code SHP.

STORAGE FACILITIES

A general-purpose warehouse is used for the storage of many kinds of items. It is *constructed* with a roof, side *walls*, and end walls. This *type* of facility normally has *both* truck loading platforms or *docks* and rail car loading *platform*. These platforms provide easy *access* to the receiving and *storage* areas of base supply. *As* a general rule, an *item* that does not require *special* storage or handling is *stored* in the general-purpose *warehouse*.

INSPECTION

Any item not received in a sealed container should be sent to the supply inspection. The *same* is true if the *information* on the condition tag *does* not agree with the *receipt* document, or if the *in-checker* thinks the receipt itself *may* be damaged. Upon receipt *of* such an item, the *supply* inspector is responsible for *determining* the condition, status, and *identity* of the item.

IN-CHECKING PROCEDURES

All receipt processing begins with off-loading of supplies. While *off-loading*, the in-checker has two *very* important tasks to consider. *First*, the supplies must be *segregated* by priority. The high *priority* receipts (priority 01 through *08*) are placed in one *area*, and the routine receipts (*priority* 09 through 20) are *placed* in another.

EXTRACT RECEIPT DOCUMENT

If the extract document is required because of split receipt, part serviceable and part unserviceable, there *will* be an extra step *in* the preparation. You must *first* change the quantity on *the* original receipt to reflect *only* the portion that is *serviceable*, no other changes are *required*. When you prepare the *extract* copy for the unserviceable *portion*, enter condition code F *in* card column 7 and *reflect* only the unserviceable amount in card columns 25 through 29.

Semantic Differential Attitude Measure

YOUR FEELINGS ABOUT THE ECI TEXTBOOKS USED IN THIS COURSE

Each of the fifteen items on the next page has two contrasting adjectives. For each item, please indicate on the seven point scale your feelings about the textbooks you studied as described by the adjectives. For example: For item (1), if you presently feel that the textbooks were -

Extremely Good.....Circle 1
Very Good.....Circle 2
Good.....Circle 3
Neither Good nor Bad.....Circle 4
Bad.....Circle 5
Very Bad.....Circle 6
Extremely Bad.....Circle 7

For item (2), if you presently feel that the textbooks were -

Extremely Dull.....Circle 1
Very Dull.....Circle 2
Dull.....Circle 3
Neither Dull nor Interesting.....Circle 4
Interesting.....Circle 5
Very Interesting.....Circle 6
Extremely Interesting.....Circle 7

ANSWER ITEMS 3-15 IN A SIMILAR MANNER.

In marking the items, keep in mind that this is a test of how you feel about the textbooks you studied. Sometimes you may feel as though you've had the same item before on the test. This will not be the case, so do not look back and forth through the items. Do not try to remember how you checked similar items earlier in the test. Make each item a separate and independent judgement. Work at a fairly high speed through this test. Do not worry or puzzle over individual items. It is your first impression, the immediate "feelings" about the items that we want. On the other hand, please do not be careless, because we want your true impressions.

I FEEL THAT MY ECI TEXTBOOK MATERIALS WERE:

1. Good ---------- Bad
   1 2 3 4 5 6 7

2. Dull ---------- Interesting
   1 2 3 4 5 6 7

3. Fast ---------- Slow
   1 2 3 4 5 6 7

4. Tense ---------- Relaxed
   1 2 3 4 5 6 7

5. Unfair ---------- Fair
   1 2 3 4 5 6 7

6. Deep ---------- Shallow
   1 2 3 4 5 6 7

7. Valuable ---------- Worthless
   1 2 3 4 5 6 7

8. Active ---------- Passive
   1 2 3 4 5 6 7

9. Easy ---------- Difficult
   1 2 3 4 5 6 7

10. Inflexible ---------- Flexible
    1 2 3 4 5 6 7

11. Exciting ---------- Boring
    1 2 3 4 5 6 7

12. Unpleasant ---------- Pleasant
    1 2 3 4 5 6 7

13. Depressing ---------- Encouraging
    1 2 3 4 5 6 7

14. Safe ---------- Dangerous
    1 2 3 4 5 6 7

15. Weak ---------- Strong
    1 2 3 4 5 6 7

PROCEED TO PART 3 ON NEXT PAGE.

Appendix L

Stratification of Subjects with Resident School Preparation on Cloze Scores, Sex, and Treatment Assignment

Cloze Scores	Total Freq	BOF Male Freq	BOF Female Freq	HIG Male Freq	HIG Female Freq
7	1			1	
8	1	1			
9	4	1	1	2	
10	3	1		2	
11	3	2			1
12	1			1	
13					
14	3	2		1	
15	5	2		2	1
16	6	2	1	2	1
17	1	1			
18	4	3		1	
19	4	1		2	1
20	5	1	1	3	
21	5	2	1	2	
22	8	3	1	3	1
23	4	1	2	1	
24	3	1		2	
25	12	3	2	6	1
26	6	3		2	1
27	10	3	2	3	2
28	6	2	1	2	1
29	1			1	
30	4	1	1	2	
31	4	1	1	1	1
32	1	1			
33					
34	1			1	
35					
36	1		1		

Appendix M

Classification of Survey Items into
Types and Subtypes

The twenty-five items from the student survey were classified into three types: (1) those pertaining to the texts, (2) those pertaining to the course examination, and (3) those pertaining to the stature of ECI. The first two were further divided into three subtypes pertaining to difficulty level, coverage of objectives, and job relevance. The items occurring in each category are shown below.

TABLE 11

CLASSIFICATION OF SURVEY ITEMS

		ITEM SUBTYPES		
		Difficulty Level	Objective Coverage	Job Relevance
ITEM TYPES	(1) Text Materials	1, 5, 6, 7	2, 3, 4	11, 12, 13
	(2) Course Examination	21, 22	19, 23, 25	20, 24
	(3) Stature of Extension Course Institute Items 17 and 18.			

Appendix N

The Survey Items and Pertinent Response Data

The results of the survey are tabulated below, and each item and its alternatives are stated as they occurred on the survey. Additionally, beneath the last alternative, a combination of alternatives is stipulated when needed (e.g., A+B indicates the number of students responding to alternatives A and B). This is followed by a row showing the number of students responding to each item. To the right of each alternative, the percentage of students responding is reported for the three materiel facilities and two food service treatment groups. Applicable percentages for the combined alternatives are shown in a similar manner. The last row of each item shows the number of students responding to that item. The first number in parentheses represents the total number of materiel facilities students who responded to the item and the second number represents total responses for food service students. The next five numbers represent the number of students responding from the various treatment groups.

For each item a decision was made to determine which of the possible alternatives or combination of alternatives represented a negative point of view. For example, for item 1 students who responded with A or B reflected the negative opinion that their course materials were too difficult for them at their present level of training.

The percentage shown in column 1, to the right of A & B represents the number of materiel facilities students from the conventional treatment group who indicated a negative opinion about their materials. The

percentage in column 2 represents the number of students who indicated a negative opinion about the BOF course materials and column 3 represents similar information about the modular treatment group. The percentages in columns 5 and 6 represent negative opinions expressed by food service students from the BOF and high impact graphic treatment groups respectively. A response or combination of responses that reflected a negative opinion was identified for all items on the survey except one (item 18) which called for a nonevaluative statement about Community College of the Air Force transcripting.

Item Response Data

ITEM	MATERIELS FACILITIES			FOOD SERVICES	
	CONVENTIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
1. The material in the text was too difficult for me at my present level of training (Measure: Text difficulty.)					
A. Strongly agree	4.49	9.41	4.39	3.50	2.59
B. Agree	10.11	23.52	18.68	12.28	7.79
C. Disagree	77.52	63.52	70.32	64.91	68.83
D. Strongly Disagree	7.86	3.52	6.59	19.29	20.77
A+B	14.60	32.93	23.07	15.78	10.38
(265) (134)	89	85	91	57	77
2. More illustrations or foldouts are needed to support the text. (Measure: Text coverage.)					
A. Strongly agree	3.37	13.95	14.28	15.51	3.89
B. Agree	47.19	39.53	29.67	37.93	18.18
C. Disagree	43.82	44.18	50.54	43.10	59.74
D. Strongly disagree	5.61	2.32	5.49	3.44	18.18
A+B	50.56	53.48	43.95	53.44	22.07
(266) (135)	89	86	91	58	77
3. The text adequately covers the behavioral objectives. (Measure: Text coverage.)					
A. Strongly agree	1.14	1.16	3.26	12.06	6.41
B. Agree	65.51	56.97	58.69	67.24	69.23
C. Disagree	27.58	33.72	28.26	20.69	20.51
D. Strongly disagree	5.74	8.14	9.78	0.00	3.84
C+D	33.32	41.86	38.04	20.69	24.35
(265) (136)	87	86	92	58	78

ITEM			MATERIELS FACILITIES			FOOD SERVICES	
			CONVEN-TIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
4. The questions at the end of each behavioral objective actually tested the objective. (Measure: Text coverage.)							
A.	Strongly agree		6.89	4.65	9.78	17.24	8.97
B.	Agree		75.86	67.44	70.65	58.62	73.07
C.	Disagree		14.94	25.58	15.21	24.13	14.10
D.	Strongly disagree		2.29	2.32	4.34	0.00	3.84
C+D			17.23	27.90	19.55	24.13	17.94
	(265)	(136)	87	86	92	58	78
5. The text is easy to read. (Measure: Text difficulty.)							
A.	Strongly agree		20.65	17.24	41.02	17.24	41.02
B.	Agree		53.93	59.30	57.60	63.79	46.15
C.	Disagree		24.71	26.74	19.56	17.24	10.25
D.	Strongly disagree		7.86	6.97	2.17	1.72	2.56
C+D			32.57	33.71	21.73	18.96	12.81
	(267)	(136)	89	86	92	58	78
6. The text contained too many technican terms. (Measure: Text difficulty.)							
A.	Strongly agree		11.23	12.79	10.87	70.34	6.41
B.	Agree		34.83	36.04	31.52	18.96	8.97
C.	Disagree		51.68	44.18	53.26	53.79	70.51
D.	Strongly disagree		2.24	6.97	4.34	6.89	14.10
A+B			36.06	48.83	42.39	29.30	15.38
	(267)	(136)	89	86	92	58	78

ITEM	MATERIELS FACILITIES			FOOD SERVICES	
	CONVEN-TIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
7. The number of acronyms and abbreviations used (i.e., ECI, USAF, DANTES, ETC.) was excessive.					
A. Strongly Agree	20.45	18.82	23.07	3.44	10.25
B. Agree	40.90	43.52	37.36	25.86	14.10
C. Disagree	36.36	31.76	38.46	67.24	70.51
D. Strongly disagree	2.27	5.88	1.09	3.44	5.12
A+B	61.35	62.34	60.43	29.30	24.35
(264) (136)	88	85	91	58	78
8. Often technical terms or acronyms were used that had not been previously defined. (Measure: Text difficulty.)					
A. Strongly agree	6.74	18.82	8.69	3.44	3.84
B. Agree	41.57	38.82	43.47	20.69	26.92
C. Disagree	47.19	41.17	44.56	75.86	66.66
D. Strongly disagree	4.49	1.17	3.26	0.00	2.56
A+B	48.31	57.64	52.16	24.13	30.86
(266) (136)	89	85	92	58	78
9. The text was easy to understand. (Measure: Text difficulty.)					
A. Strongly agree	5.61	3.52	9.78	13.79	26.92
B. Agree	57.30	52.94	53.26	57.24	61.53
C. Disagree	33.70	35.29	31.52	15.51	8.97
D. Strongly disagree	3.37	8.23	5.43	3.44	2.56
C+D	37.07	43.52	36.95	18.95	11.52
(266) (136)	89	85	92	58	78

ITEM			MATERIELS FACILITIES			FOOD SERVICES	
			CONVEN-TIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
10. The illustrations and foldouts adequately supported the text. (Measure: Text coverage.)							
A.	Strongly agree		3.37	3.52	14.13	10.34	10.25
B.	Agree		56.18	78.82	61.95	51.72	66.66
C.	Disagree		38.20	14.11	19.56	31.03	20.51
D.	Strongly disagree		2.24	3.52	4.34	6.89	2.56
C+D			40.44	27.63	23.90	37.92	23.17
	(266)	(136)	89	85	92	58	78
11. Do you think that your ECI course gave you too much material, more than you needed at your particular stage in the Air Force? (Measure: Text relevance.)							
A.	Yes		26.96	33.33	36.95	24.13	18.88
B.	No		71.91	64.28	61.95	75.85	80.22
A			-	-	-	-	-
	(265)	(135)	89	84	92	58	77
12. There is more material in this text than needed to do my job. (Measure: Text relevance.)							
A.	Strongly agree		16.85	26.19	31.52	16.07	14.10
B.	Agree		34.83	30.95	32.60	30.25	28.20
C.	Disagree		40.44	39.28	28.26	50.00	47.43
D.	Strongly disagree		7.86	3.57	7.60	3.57	10.25
A+B			51.68	57.14	64.12	46.42	42.30
	(265)	(134)	89	84	92	56	78

ITEM			MATERIELS FACILITIES			FOOD SERVICES	
			CONVENTIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
13. What percentage of topics discussed in the text do not relate to your present job? (Measure: Text relevance.)							
A.	75 percent		21.34	23.52	20.87	21.42	14.28
B.	50 percent		26.96	30.58	28.57	25.00	23.37
C.	25 percent		35.95	35.29	39.56	32.14	36.36
D.	All topics relate to my present job		15.73	10.58	10.98	21.42	25.97
A+B			48.30	54.10	49.44	46.42	37.65
	(265)	(133)	89	85	91	56	77
14. The tasks described in this course are more complex than the tasks I perform on the job. (Measure: Text relevance.)							
A.	Strongly agree		14.60	24.70	28.26	8.62	8.97
B.	Agree		48.31	42.35	36.95	32.75	32.05
C.	Disagree		34.83	32.94	31.52	51.72	52.56
D.	Strongly disagree		2.34	0.00	3.26	6.89	6.41
A+B			62.91	67.05	65.21	41.37	41.02
	(266)	(136)	89	85	92	58	78
15. Of the different types of equipment discussed in this course, I have used or been in contact with (Measure: Text relevance.)							
A.	all of them.		10.11	15.11	14.13	22.41	21.79
B.	most of them.		51.68	41.86	41.30	62.06	53.84
C.	few of them.		19.10	22.09	23.91	13.79	15.38
D.	very few of them.		19.10	20.93	20.65	1.72	8.97
C+D			38.20	43.02	44.56	15.51	24.35
	(267)	(136)	89	86	92	58	78

ITEM			MATERIELS FACILITIES			FOOD SERVICES	
			CONVEN-TIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
16. Of the tasks described in this course, I have performed or come in contact with (Measure: Text relevance.)							
A.	all of them.		0.00	0.00	2.17	10.34	10.25
B.	most of them.		39.32	29.41	36.95	72.41	57.69
C.	few of them.		46.06	56.47	43.47	13.79	28.20
D.	very few of them.		14.60	14.11	17.39	3.44	3.84
C+D			60.66	70.58	60.86	17.23	32.04
	(266)	(136)	89	85	92	58	78
17. Does it give you more confidence in the quality of your ECI course to know that ECI has been nationally accredited by the National Home Study Council? (Measure: ECI stature.)							
A.	Yes		31.46	22.35	29.67	39.65	38.46
B.	No		37.07	40.00	29.67	25.86	29.48
C.	Accreditation has no relation to course quality		29.21	37.64	40.65	32.75	30.76
B			-	-	-	-	-
	(265)	(136)	89	85	91	58	78
18. Soon, many ECI courses will be transcripted by the Community College of the Air Force. What will be the effect of listing ECI course completions on your transcript? (Measure: ECI stature.)							
A.	It shows that the civilian community recognizes the training I have received.		5.68	13.09	10.11	20.69	14.47
B.	It will help me secure employment when I leave the service.		6.81	11.90	6.74	8.62	10.52

ITEM		MATERIELS FACILITIES			FOOD SERVICES	
		CONVEN-TIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
C.	It will help reflect all of my Air Force training.	13.63	13.09	14.60	6.89	9.21
D.	All of the above.	73.86	61.90	68.53	63.79	65.78
	(261) (134)	88	84	89	58	76
19.	The course examination asks questions about material not in the text. (Measure: Examination coverage.)					
A.	Strongly agree	7.95	20.00	10.87	6.78	2.56
B.	Agree	26.13	34.11	29.34	20.33	19.23
C.	Disagree	54.54	42.35	51.08	59.32	65.38
D.	Strongly disagree	11.36	3.52	8.69	13.55	12.82
A+B		34.08	54.11	40.21	27.11	21.79
	(265) (137)	88	85	92	59	78
20.	The course examination covered the most important concepts relating to my job. (Measure: Examination relevance.)					
A.	Strongly agree	13.63	3.48	7.60	10.16	2.59
B.	Agree	46.59	51.16	42.39	64.40	76.62
C.	Disagree	31.81	34.88	29.34	22.03	11.68
D.	Strongly disagree	7.95	10.46	20.65	3.39	9.09
C+D		39.76	45.34	49.99	25.42	20.77
	(266) (136)	88	86	92	59	77

ITEM			MATERIELS FACILITIES			FOOD SERVICES	
			CONVENTIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
22. The course examination is too easy to really test my knowledge of the material. (Measure: Examination difficulty.)							
A.	Strongly agree		0.00	0.00	2.22	8.47	1.29
B.	Agree		6.74	6.97	1.11	8.47	14.28
C.	Disagree		79.77	68.60	80.00	77.96	74.02
D.	Strongly disagree		13.48	24.41	16.66	5.08	10.39
A+B			6.74	6.97	3.33	16.94	15.57
	(265)	(136)	89	86	90	59	77
23. Most course examination questions came directly from the volume review exercises. (Measure: Examination coverage.)							
A.	Strongly agree		19.31	4.70	5.43	8.62	14.47
B.	Agree		59.09	44.70	35.87	67.24	57.89
C.	Disagree		18.18	31.76	38.04	22.41	25.00
D.	Strongly disagree		3.40	18.82	20.65	1.72	2.63
C+D			21.58	50.58	58.69	24.13	27.63
	(265)	(134)	88	85	92	58	76
24. Most course examination questions are about subjects important to my job. (Measure: Examination relevance.)							
A.	Strongly agree		9.09	4.65	7.69	6.89	16.88
B.	Agree		48.86	50.00	48.35	70.69	68.83
C.	Disagree		29.54	32.55	30.76	22.41	11.68
D.	Strongly disagree		12.50	12.79	13.18	0.00	2.59
C+D			42.04	45.34	43.94	22.41	14.27
	(265)	(135)	88	86	91	58	77

ITEM	MATERIELS FACILITIES			FOOD SERVICES	
	CONVENTIONAL	BOF	MODULAR	BOF	HIGH IMPACT GRAPHIC
25. When preparing for the course examinations, I studied: (Measure: Examination coverage.)					
A. Only the volume review exercises	29.88	20.00	22.98	22.80	20.00
B. The text and the volume review exercises	22.98	37.64	29.88	36.84	28.00
C. Only the text	3.44	3.52	2.29	7.01	5.33
D. The text, the volume review exercises, and the chapter review exercises	43.67	38.82	44.82	33.33	46.66
A+C	33.32	23.52	25.27	29.81	25.33
(259) (132)	87	85	87	57	75

Appendix O

The Frequency of Occurrance of Arrays

Both the Material Facilities and the Food Service study had groups that were issued innovative textbooks. For the Materiel Facilities study, this was the modular group and for the Food Service study the high impact graphics group. As the modular and the high impact graphics groups were the focus of attention, analysis of the survey items highlighting these groups was a primary concern. To facilitate this analysis the survey items were first grouped according to their type and subtypes, then the relative standing of the frequency of response for each treatment group was examined within each of the seven groupings.

For ease of description, the relative standings on the frequency of responses for each item was represented by an array. For example, letting C, B, and M respectively represent the conventional, BOF, and modular courses for the materiel facilities course, the array CBM would indicate that the conventional course had the lowest percentage of subjects holding a derogatory opinion about the item, the BOF the next lowest and the modular the highest. Letting B and H respectively represent the BOF and HIG courses for the food service course, the array BH would indicate that the BOF course had the lowest percentage of subjects holding a derogatory opinion about the item and the high impact graphics course the highest.

Using the above definition of an array, it is noted that there are six possible arrays for the materiel facilities course and two for

the food service course. Possible arrays for the materiel facilities courses were CMB, MCB, CBM, MBC, BMC, and BCM. Possible arrays for the food service courses were BH and HB.

Table 11 shows the frequency of occurrance for arrays and rankings. Column 1 identifies the array and column 2 indicates the frequency of the arrays occurrance. Column 3 identifies the specific treatment and columns 4, 5, and 6 identifies the treatments ranking. For example of the 24 items on the survey that were considered, the most frequently occurring array was CMB which occurs on 10 items. Then too, treatment C was ranked first (most positive) 16 times, 2nd (less positive) 6 times, and 3rd (most negative) 2 times. Frequency of occurrancy of arrays and treatment rankings are likewise presented for the food service where only two rankings prevailed. The arrays are described above are also used in Tables 12 and 13 where separate depcitions are given for the materiel facilities course and the food service courses, respectively. Tables 12 and 13 group the items into seven categories depending on the intent of the item.

TABLE 12

FREQUENCY OF OCCURRANCE OF ARRAYS
AND TREATMENT RANKINGS

Possible	Frequency of Arrays	Treatment	Frequency of Ranking Arrays 1st	2nd	3rd
Materiel Facilities Courses					
CMB	10	C	16	6	2
MCB	6	B	1	7	16
CBM	6	M	7	11	6
MBC	1				
BMC	1				
BCM	0				
Food Service Courses					
HB	17	H	17	7	
BH	7	B	7	17	

TABLE 13

FREQUENCY OF OCCURRANCE OF ARRAYS AND TREATMENT RANKING FOR SEVEN CATEGORIES

Type	Category	Arrays	Frequency of Arrays	Treatment	Frequency of Ranking 1st	2nd	3rd
Items	Text Materials						
1,5,6, 7,8,9	1. Difficulty level	CMB	3	C	3	3	0
		MCB	3	B	0	0	6
				M	3	3	0
2,3,4, 10	2. Course coverage	CMB	2	C	2	1	1
		MBC	1	B	0	1	3
		MCB	1	M	2	2	0
11,12,13 14,15,16	3. Relationship to job	CBM	3	C	6	0	0
		CMB	3	B	0	3	3
				M	0	3	3
	Course Examinations						
21, 22	4. Difficulty level	MCB	1	C	1	1	0
		CBM	1	B	0	1	1
				M	1	0	1
19, 23, 25	5. Course coverage	BMC	1	C	2	0	1
		CBM	1	B	1	1	1
		CMB	1	M	0	2	1
20, 24	6. Relationship to job	CBM	1	C	2	0	0
		CMB	1	B	0	1	1
				M	0	1	1
Items that relate to stature or status of ECI course materials							
17, 18	7. Status	MCB	1	C	0	1	0
				B	0	0	1
				M	1	0	1

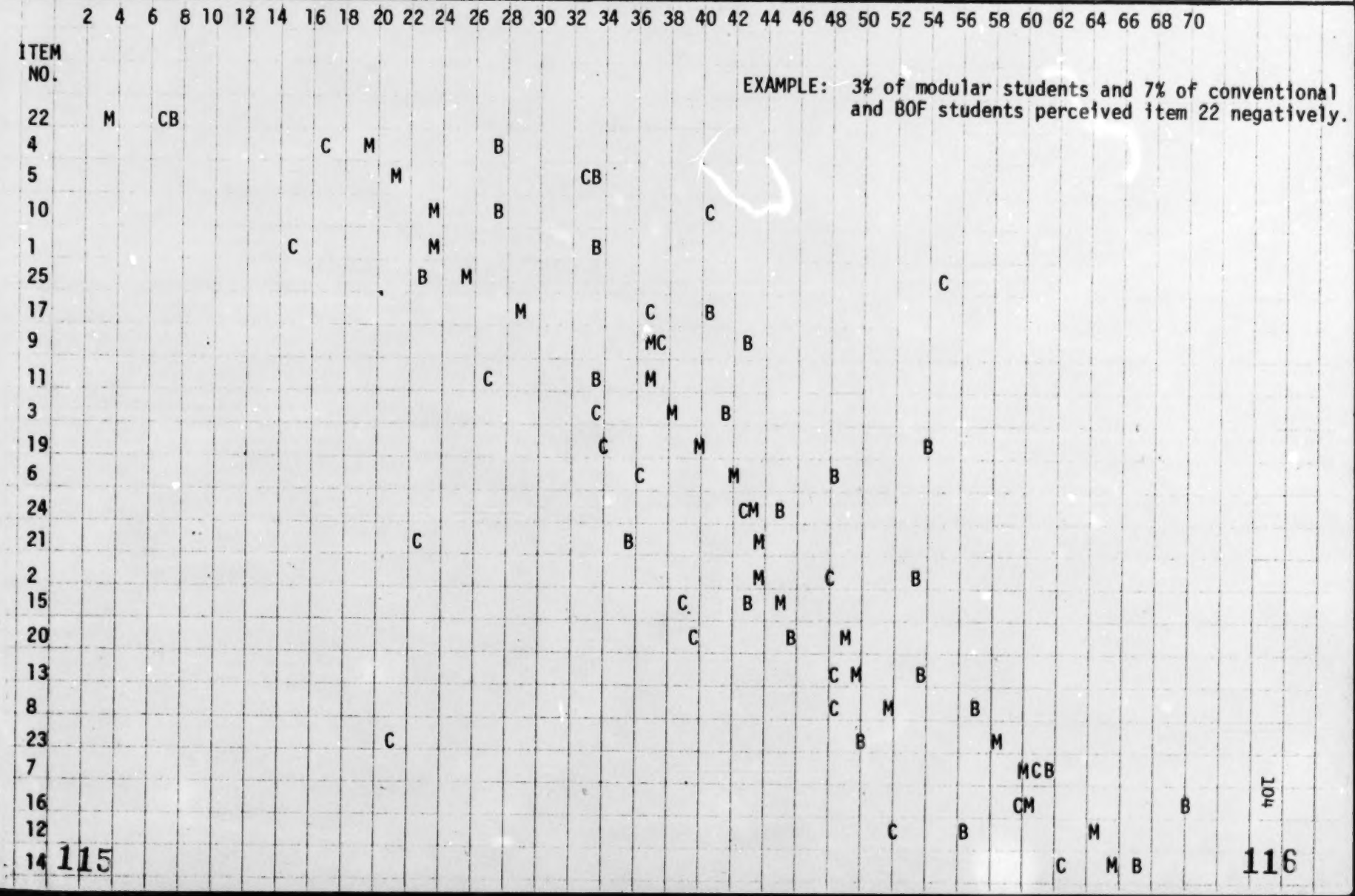
TABLE 14

FREQUENCY OF OCCURRANCE OF ARRAYS AND TREATMENT RANKINGS FOR SEVEN CATEGORIES

Type	Category	Arrays	Frequency of Arrays	Treatment	Frequency of Ranking 1st	2nd
Items	Text Materials					
1,5,6, 7,8,9	1. Difficulty level	HB	5	H	5	1
		BH	1	B	1	5
2,3,4, 10	2. Course coverage	HB	3	H	3	1
		BH	1	B	1	3
11,12,13 14,15,16	3. Relationship to job	HB	4	H	4	2
		BH	2	B	2	4
	Course Examination					
21, 22	4. Difficulty level	HB	1	H	1	1
		BH	1	B	1	1
19, 23 25	5. Course coverage	HB	2	H	2	1
		BH	1	B	1	2
20, 24	6. Relationship to job	HB	2	H	2	0
				B	0	2
	Items that relate to stature or status of ECI course materials					
17, 18	7. Status	BH	1	H	0	1
				B	1	0

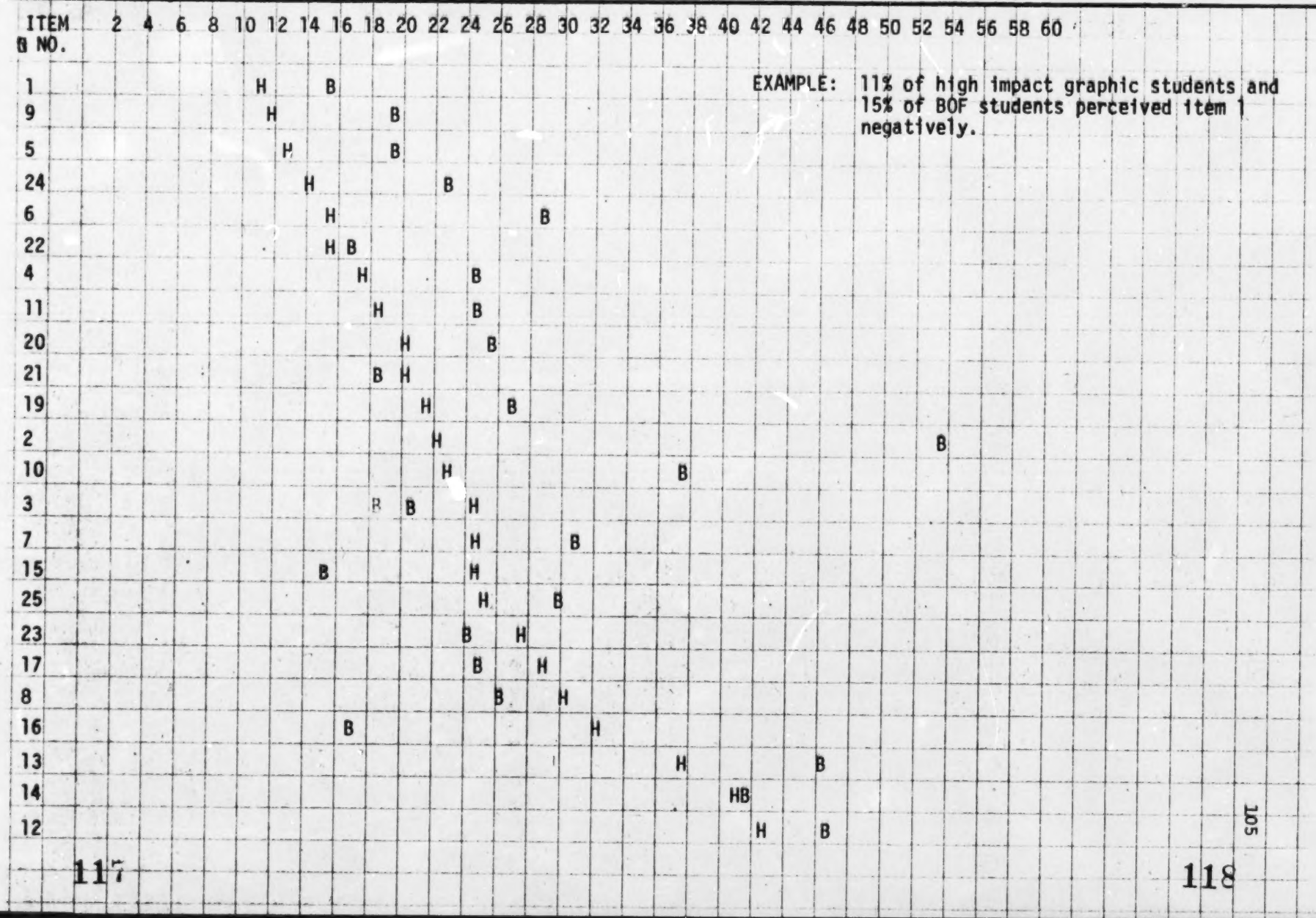
Appendix P

Percentage of Materiel Facilities Students Responding Negatively to Survey Items


2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70
ITEM NO.
EXAMPLE: 3% of modular students and 7% of conventional and BOF students perceived item 22 negatively.
22 M CB
4 C M B
5 M CB
10 M B C
1 C M B
25 B M C
17 M C B
9 MC B
11 C B M
3 C M B
19 C M B
6 C M B
24 CM B
21 C B M
2 M C B
15 C B M
20 C B M
13 C M B
8 C M B
23 C B M
7 MCB
16 CM B
12 C B M
14 C M B

Appendix Q

Percentage of Food Service Students Responding Negatively to Survey Items


ITEM NO.
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
1 H B
9 H B
5 H B
24 H B
6 H B
22 H B
4 H B
11 H B
20 H B
21 B H
19 H B
2 H B
10 H B
3 B B H
7 H B
15 B H
25 H B
23 B H
17 B H
8 B H
16 B H
13 H B
14 HB
12 H B
EXAMPLE: 11% of high impact graphic students and 15% of BOF students perceived item 1 negatively.

Appendix R

HYPOTHESES

Materiel Facilities Specialist Study	Food Service Study
Effects of Instruction on Performance	
H_1: Students who study modular course materials will show significantly better performance scores than those students who study BOF materials.	H_1: That students who study high impact graphic course materials will show significantly better performance scores than those who study BOF materials.
H_2: Students who study modular courses will show significantly better performance scores than those who study conventional materials.	
H_3: Students who study BOF materials will show significantly better performance scores than students who study conventional materials.	
Effects of Reading Ability on Performance	
H_4: High ability readers will perform significantly better than low ability readers.	H_2: That high ability readers will perform significantly better than low ability readers.
Unique Effects of Treatments on Reading Ability Levels	
H_5: High ability readers will show little difference in performance from one treatment to another while low ability readers will demonstrate poorest performance using conventional texts, intermediate performance with BOF, and highest performance using the modular materials.	H_3: That high ability readers will show little difference in performance from one treatment to another while middle and low ability readers will demonstrate best performance using high impact graphic course materials and poorest performance using BOF materials.
Effects of Format on Student Attitude	
H_6: Students who study the modular course will display a significantly more positive attitude toward their training materials than those who receive the BOF version.	H_4: That students who study the high impact graphic course will display a significantly more positive attitude toward their training materials than those who receive a BOF course.
H_7: Students who study the modular course will display a significantly more positive attitude toward their training materials than those who receive the conventional course.	
H_8: Students who study BOF course materials will display a significantly more positive attitude toward their course materials than those who receive the conventional course.	
Effect of Format on Completion Times	
H_9: The completion time for students using modular materials will be significantly shorter than for students using BOF materials.	H_5: The completion time in days for students using high impact graphic materials will be significantly shorter than for students using BOF materials.
H_{10}: The completion time for students using modular materials will be significantly shorter than for students using the conventional materials.	
H_{11}: The completion time for students using BOF materials will be significantly shorter than for students using conventional materials.	

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